



Improve your technique



V. Kramer/The Image Bank

Going on safari

An African safari offers a wealth of opportunities for photographers. But to make the most of such a trip it is important to know what problems you are likely to face

Announce that you plan to go on a photographic African safari and you will get plenty of advice—but little of it based on actual experience, and much of it probably conflicting. Not knowing what to expect, you may end up by taking totally unsuitable gear, and possibly wasting a rare opportunity.

An increasing number of people are now able to travel to the famous game parks of East Africa, however, and there is no need to be unprepared. The game parks offer marvellous opportunities for photography, but the approach and equipment you will need may be quite different from what you are used to, even if you are fairly experienced in wildlife photography.

Before you leave home you will probably have a preconceived idea of what conditions will be like. In fact, the equipment and materials you will need depend more than usual on the kind of vehicle you will be travelling in, and

even on the driver and the other people you are with.

It is possible to book two- or three-week photographic safaris, where you will be in the company of other photographers and where you should have ample time to take the shots you want. But many people travel on a package tour to a tourist resort, with the safari as an extra.

If you are travelling on a package holiday, you will probably be offered a standard three-day safari when you book. The price may well be lower than what you would pay if you were actually in Africa, as the operators like to receive foreign currency. The only disadvantage—and it could be significant—is that you will probably not be able to see what kind of vehicle you will be travelling in

Driving dust A constant problem when driving is dust which gets into the vehicle and on to your camera gear

beforehand. If you book when you are actually on the spot, you can see what sort of facilities each firm offers, and assess the condition of their vehicles.

The type of vehicle you travel in is very important to the success of your photography. Most unsuitable of all is an ordinary coach or bus. Though the windows will probably slide fully open, you are very restricted in the view you get and it can be very difficult to steady the camera. There are so many other people on the bus that you will have little say in how long you stop at any particular location, and will probably not be able to leave the vehicle except when everyone else does. Coaches are unsuitable for game drives, but even if you transfer to smaller vehicles once in the game park, you may miss many good shots on the way there.

The most common vehicles for safaris are of the Volkswagen Kombi variety. These have seats for seven people plus



occasional halts for picturesque views or small groups of animals. There is no reason why you should not see game on the way to the parks, since the animals are not restricted in any way, other than those which are in the wildlife parks near cities, for example, which are similar to safari parks elsewhere but on a larger scale. There is a tendency to photograph every antelope that appears at this stage, but you will almost certainly see more animals when you get to the park itself. Even so, events are unpredictable and it is worth taking a few 'contingency shots' at this stage. Although most people do see a good range of animals, it is possible that even an area you have heard good reports of may suddenly be deserted. This applies particularly to the huge Kenyan parks, Tsavo East and West. You can drive long

(above) on the roof of the vehicle. A securely mounted tripod head (below) gives maximum steadiness but restricts your shooting position. A bean bag (bottom) is most useful but can be very bulky to carry around

driver, and have a roof which lifts up sufficiently to allow those in the back to stand up. There is enough room to rest a camera or mini tripod on the non-lifting part of the roof, and there is reasonable all-round visibility even when others are standing up.

These vehicles are not particularly suited to the rough terrain, though they stand up to it remarkably well. Better designed for the high temperatures, dust and poor road surfaces are vehicles such as Range Rovers or Land Rovers. Some have lifting roofs, and are particularly suitable for safaris. Even in the dry season muddy patches may be encountered, and four wheel drive could be invaluable.

It is also possible to travel on safari in an ordinary saloon car. These can be hired, and are likely to be more comfortable than one of the tour operators' vehicles. A sunroof would be very useful, although you cannot gain as much height as in a Land Rover or Kombi.

Some vehicles are equipped with attachments that allow a camera to be mounted directly on the vehicle. This can be an advantage if there are not many other people in the vehicle, but may be rather restrictive if things happen quickly and you are limited to views on one side of the vehicle only.

It may be tempting to hire your own vehicle and choose your own itinerary. This is not particularly dangerous, but there are advantages in having the expertise of a local driver. He will know the best places to find particular animals, and may well be able to spot animals merging in with the bush, which you would otherwise miss. He will also get information from other drivers, or from local people who speak little English.

What to expect

A three-day safari usually consists of a long drive to one national park, followed by long drives through the various parks along unmade roads. Much of the time is taken up by travelling, with

Support variations There are many ways you can support your camera. Probably the simplest is to use a towel



distances through either of these and catch no more than a fleeting glimpse of some animals, while other people a few days earlier or later, or in another season, may see multitudes of animals. Other areas, such as Kenya's Masai Mara or Tanzania's Ngorongoro Crater, are usually more reliable. So while it is worth taking some pictures of the first animals you see, do not use up too much film on them. You will at least gain some experience of photographing from the vehicle you are in.

A typical encounter with an animal occurs while bouncing along the road at speed. The driver spots something and comes to a halt. The animal pricks up its ears as he does so, and the occupants of the vehicle all crowd over to one side to try to catch a glimpse of the animal, which by this time has either run off or is thinking about it. There is no time for anything except a 'grab shot'—a straightforward spur-of-the-moment snap, with little time for composition or exposure control. If the animal does hang around for a longer time, it is unlikely that the others with you will want to continue looking at it for a long time while you fiddle with lenses, particularly if you are on the way somewhere. Quite often the driver will not even switch off the engine, which means that you have the vehicle vibration to contend with. If this happens, it is always worth asking him to do so, but he may be unwilling in case the engine does not start again.

The journeys to the game parks can be quite arduous, both for you and for your equipment. The roads are rough and the distance to be covered is great, so drivers often travel at quite high speeds. You have the choice of becoming very hot with the windows closed or getting covered with dust with the windows open, particularly if your vehicle is



Chris Harvey

following another. Any uncapped lens will rapidly become coated with red dust, and changing a lens offers the chance for dust to get into the camera. While travelling, it is a good idea to keep all the lenses you are not using wrapped in plastic bags.

The jolting of the vehicle is guaran-

Cheetah A medium telephoto may be quite adequate since you can often drive in very close to the animals

Distant dinner A mirror lens, like the one used for the above shot, allows you to shoot without disturbing the scene, yet is very light and compact

teed to undo any loose knobs or screws on your equipment. Your tripod in particular will suffer from this—the knobs on the pan-and-tilt head will almost certainly undo themselves and get lost on the floor. You may not notice this loss until you have left the vehicle. Keep checking that every knob, screw and bolt is tight. As for personal comfort, a Thermos of any cold drink is welcome. It is not common for vehicles to carry any supplies of water.

When you reach the park, you will probably find that the safari lodges are well appointed and comfortable. There is often a fair amount of wildlife to photograph even there—birds, monkeys, baboons and antelopes. This may actually be your only chance of taking pictures at your own rate, with time to compose each shot. Make the most of it—even the smaller animals may be unusual and worth a picture. Some lodges are built near waterholes and in the evening and early morning you can photograph the animals coming to drink.

Many safaris include an early morning game drive before breakfast which is worth getting up for. The animals are often at their most active at this time.

The animals

Finding particular animals is best left to your driver. If there is a particular animal you want to see, mention it and he may be able to ask around. He may



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ignore such unglamorous but amusing animals as warthogs, or birds, in favour of the classic big game such as lions, rhinos and cheetahs. Such creatures as giraffes, zebras, antelopes, elephants, buffalos and waterbuck are usually plentiful, while you will be very unlucky if you do not see any lions. It is worth finding out something about the animals of the area beforehand so that you can tell the difference between, say, an impala and a Thomson's gazelle when

Shy impala Even timid animals can be photographed using only moderate telephoto lenses, with patience



you see one.

Among the easiest animals to photograph, surprisingly enough, are lions. They spend most of their time lazing around, and simply watch impassively as vehicles draw up around them. It is possible to get pictures of lions under these circumstances with the simplest of cameras, with no special lenses. Large animals such as elephants and buffalos may also be approached by an experienced driver, but anyone unfamiliar with the habits of the wildlife should keep a respectful distance. Any animal with young, in particular, is likely to feel threatened if you get too close.

It is far more difficult to approach animals which are preyed on, such as antelopes, zebras, giraffes and ostriches. In some places these may have become used to the presence of vehicles, but in others they will run away as soon as your vehicle approaches within a certain distance—usually just a little too far for good photography. Sometimes they will wait for a while, then become disturbed by the strange object with heads bobbing about inside, and will run away just as you have decided that you can afford to change to a longer focus lens.

If you are driving yourself, rather than using a local driver, you may be able to wait long enough for the animals to settle down. Self-driving gives you this flexibility but you miss out on the local knowledge. In this case, the best policy is to assume that the locals know where they are going and follow them. Alter-

Sleepy cat You should be constantly on the lookout for animals in unusual or unexpected places

natively, keep an eye open for a small knot of other vehicles—you can be fairly sure that there will be lions or other interesting animals at the heart of it. You can also ask one of the park wardens for advice: he may even be willing to accompany you.

Taking the pictures

Ideally, on a photographic safari you should take as wide a range of photographic equipment as possible—the heaviest tripod, the longest focal length of lens you can afford, and everything in between. In practice, you will have to select carefully. The more equipment you have, the harder it is to move around.

A good deal of your photography will be grab shots. The ideal equipment for these is a focal length of around 200 mm and an auto-exposure camera. An 80–200 or similar zoom lens is adequate, but its maximum aperture of, say, $f/4$ is reduced by up to half a stop by internal absorption, so a fixed focal lens will give superior results and allow you to choose a faster shutter speed. But the zoom does have the advantage of also allowing you to take pictures of the larger animals which you can approach more closely, so it is probably the most useful all-round lens.

Keep the camera on as fast a shutter

speed as you dare: the depth of field is not too shallow at the distances you are likely to be focusing on, so it is probably better to make sure that the shot is not spoiled by movement—either your own camera shake, movement or vibration of the vehicle, or someone else's nudging in the melee to get a view.

A longer focal length is also worth having, where you have the opportunity to take more care over your photography. A lens of, say, 300 mm or longer is somewhat unwieldy for grab shots, however, as it must be used with some support. Many people imagine that a very long focal length is essential on safari: this is not so, but it is certainly a valuable part of your equipment. There will almost certainly be occasions where you can put one to good use. Rather than buy a lens for the occasion, you might find that a good quality $\times 2$ converter for your 200 mm lens or zoom will give you all the magnification you need. Some of the best wildlife shots by experts such as Hugo van Lawick are taken with quite modest focal lengths—but he is able to spend time getting close to the animals and waiting for the action. Very long focal lengths also emphasize the effects of heat haze.

Wide angle lenses are useful for scene setting: you can take pictures of your companions actually watching a pride of lions from inside your vehicle.

Supporting the camera can be difficult. One of the simplest methods is also the most flexible—use a towel to rest your

camera on the roof of your vehicle, assuming it has a lifting roof. A towel can also be useful if you have to photograph from a bus. A bean bag is more versatile than a towel, though not as easy to obtain. Both a towel and a bean bag allow you to rest a camera against an awkwardly shaped surface while pointing it in the direction you want. Another portable item, particularly valuable in a bus, is a monopod. With this supporting the camera and the lens resting on the window or roof of the vehicle, with a towel or bean bag in between, you have a steady support.

The lighting in Africa is not always brilliant. In summer it can be noticeably stronger than in temperate latitudes, but for much of the time there is no more light than you are used to. It can be cloudy or dull, so you should not assume that light will be no problem when choosing what film to take.

Your choice of film is quite critical. You can make use of the entire range of film speeds, from 25 to 400 ASA (ISO), on a safari, but all at different times. If you have a reasonably fast lens, of $f/4$ or wider, you can make use of fairly slow, fine grain film for your grab shots as well as for general work. A film of 64 to 100 ASA is adequate in sunny conditions, and will allow greater enlargement. If the light is not very good, as on cloudy-bright days or on early morning game drives, then faster film is needed—up to 400 ASA. Fast film is also necessary if you want to use a long focal length, slow

Typical Exposures

A typical maximum setting for bright sunlight using 54 ASA film is $1/125$ at $f/11$, or $1/250$ at $f/8$. This means that if you have a 500 mm mirror lens, whose f -number is 8, but which loses a stop or light as a result of the central obstruction, you can only take pictures at $1/125$ second and will need some support even in bright conditions.

A 200 mm $f/4$ zoom lens may lose half a stop of light in internal absorption, while a $\times 2$ converter has a further loss of two stops. This means you are working at $f/10$, and can use a shutter speed of about $1/175$, not enough for you to hand-hold the lens.

These are settings for the brightest lighting conditions, between 9 am and 3 pm. At other times, you must either use good camera supports or shoot on faster film. 400 ASA film will allow you an extra 2½ stops, allowing you to hand-hold the camera in duller conditions.

lens from a vehicle. At the other end of the scale, you can use 25 ASA Kodachrome in circumstances where you have time to secure high quality shots. As you are likely to be using more film than usual, it is quite feasible to choose a particular film for just a fairly short session—it will soon be used up. Even so, two camera bodies, loaded with different speeds of film, can be very useful.

Sunset hues The best times of day for photography are often at dawn or dusk when a faster film may be useful



Special b & w films

There are many subjects for which ordinary black and white film is unsuitable. To photograph them satisfactorily, you must choose the most appropriate from a wide range of special purpose films

In addition to the familiar range of black and white films used for everyday photography, there are many others designed for specialized purposes. A special b & w film might be suited to a particular job that you have in mind, so it is worth knowing what is available.

Even if you consider only those films with 35 mm sprocket holes, which can be used in an SLR, there is still a bewildering range. Each has a specific role, but there is no reason why you should not use them for different purposes. For example, microfilm is ideally suited to copying documents, but it can also be used for photographing the sun, with suitable equipment. Alternatively, high speed film designed for surveillance purposes in low light can be used for moody shots in night clubs and so on, or for exaggerated grain effects on landscapes. But a word of warning—it is only worth considering specialist films if you have tried the appropriate conventional film and found it unsuitable. There is no magic ingredient that will instantly transform your general photography.

Few special purpose films can be bought over the counter from a dealer in the usual way, because there is so little demand for them that they would become outdated before they were sold. They must be ordered but in many instances, dealers will not supply less than a certain minimum quantity. And the fear of being left with outdated stocks of films that are little in demand is so great that most dealers ask for payment at the time of ordering, because some customers do not return for goods ordered.

Conventional films already cover a wide range of performance. They are all *panchromatic*—that is, they are sensitive to the visible range of colours—and they have roughly the same relationship between speed, sharpness and grain so that an increase in speed gives coarser grain with some loss of sharpness. This relationship is inherent in the nature of film, so with the exception of the chromogenic films Ilford XP1 and Agfa Vario XL (see page 394), there is no advantage in providing a specialist film that has similar characteristics to conventional films. This means that specialist films generally extend the range of properties of conventional films, for example in terms of speed, or in colour sensitivity, or in the exposure time for which they are designed. Generally speaking, special purpose films fall into



Minimum order Specialist black and white films are packaged as single cassettes or rolls of 30 m or more

one of three broad categories—high contrast; special colour sensitivity; and technical and recording films.

High contrast films

Ordinary camera films cannot give sufficiently high contrast for copying line diagrams or documents. One popular film for this purpose is Agfaortho 25. This has a speed of about 25 ASA (ISO) and, being insensitive to red, it can be developed by inspection in the light from a red safelight. An ordinary print developer can be used for 2 to 4 minutes, if this is convenient.

Many firms make slow, high contrast films, typical names are Microfile and Microneg, but there are many others in this group. A few are blue-sensitive only but most are panchromatic with a film speed of about 25 ASA. When slow, contrasty films are used for copying, they will have a different response from the quoted speed. For example, Recordak AHU Microfilm 5480 is rated at 64 ASA for copying and 2 ASA for general purpose photography. A few experiments are always advisable to find the optimum setting under individual circumstances. ('Recordak' is a Kodak trade name and is pronounced with the accent on the first syllable.)

Where the background of a diagram or document is faded or has a yellowish

LPD 4



Very high contrast positive ortho film, rated at 2 ASA and developed in a paper developer



5302



Fine grain and very high contrast, rated at 2 ASA and developed in a paper developer



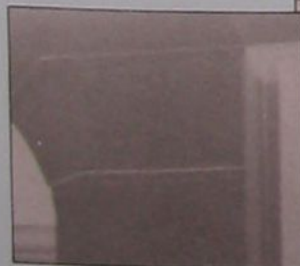
LITH FILM



Suitable for slides, rated at 20 ASA and developed in a paper developer



RPC



Direct reversal rapid process copy film, rated at 5 ASA and developed in a paper developer



tint, a fine grain release positive film is used. More usually, this is called Fine Grain Positive or just Positive film. Kodak manufactures this as Type 5302. Fine Grain Positive resembles a paper emulsion on a transparent base. The name comes from its use in producing positive transparencies from prepared negatives but this is best done outside the camera. The film's very fine grain makes it suitable for high quality recording of continuous tone subjects.

The various high contrast films are particularly suitable for direct reversal processing—the making of black and white transparencies. This method is an alternative to the more usual one by which negatives are printed on to film in the darkroom.

Essentially, the direct reversal process consists of development, bleaching and redevelopment. Although effective, this method gives little range in either exposure or processing. Agfa-Gevaert Dia-Direct is a panchromatic monochrome slide film. It is rated at 32 ASA, with a high resolution and fine grain. Films intended for reversal processing should not be developed as negatives (see page 978), because the dichroic silver used against halation must be dissolved in the reversal bleach bath. There is, however, a 35 mm film—LPD-4—that gives a positive image without reversal printing. This film is slow, blue-sensitive and of high contrast. The reversal stage is omitted simply by processing in ordinary paper developer.

Kodalith film is available in 35 mm format, and is known as Kodalith Ortho Film 2556, Type 3. Though the unique effects available using lith film in lith developer are best suited to darkroom work (see page 914), you may find that it is suitable for some forms of copying or slide making. This film has a thin emulsion which is easily scratched, but its speed rating of between 10 and 20 ASA makes it suitable for use as an ordinary camera film.

Special colour sensitivity films

All films are sensitive to blue light and, to a lesser extent, to ultraviolet radiation. Others can be sensitized, by the addition of various dyes, to green. These films—called *orthochromatic*—were very common at one time but now they are scarce. The lack of red sensitivity can be used to give unusual effects, such as a dark red rose against a plain, white sky. Usually, however, the main advantage of blue sensitive and orthochromatic films is easy manipulation in the darkroom.

Normal black and white films are panchromatic—they are sensitive to the entire visible spectrum. For technical work, there are panchromatic films with extended red sensitivity—their spectral response is boosted at the red end. These are useful for shooting in low light levels, particularly indoors in tungsten light. The red sensitivity makes more use of the light available, particularly in

Bob Cross

2476



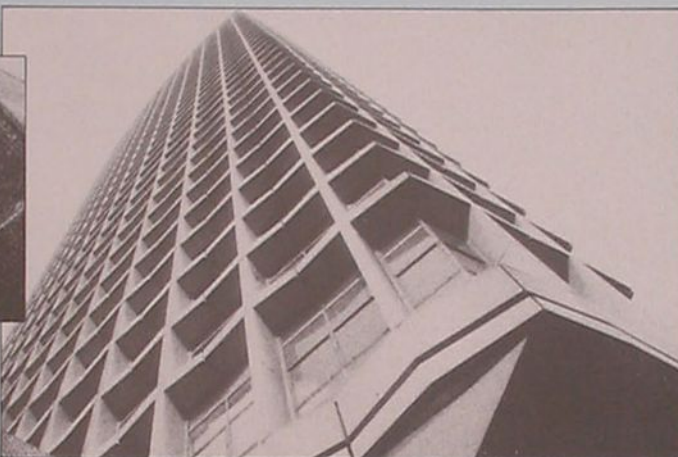
Grainy film with extended red sensitivity. It is rated at 500 ASA and developed in HC-110



2495



Fairly grainy rapid access ortho film, rated at 400 ASA and developed in HC-110



2415



Technical Pan film with extended red, rated at 25 ASA and developed in POTA



2484



High speed panchromatic recording film, rated at 250 to 1000 ASA and developed in D-76



tungsten lighting, but it is undesirable for portraits because veins appear unnaturally light or dark—in fact those people with veins close to the skin surface show particularly prominently.

Kodak's Technical Pan Film 2415 has extended red sensitivity with extremely fine grain and high resolution. Depending on the subject, it can be processed to a wide range of different contrasts by varying the development, though it is essentially a high contrast film. It is useful for slide-making, copying and personal microfilming. Some experts claim it is particularly suitable for astronomical subjects, including the moon and planets.

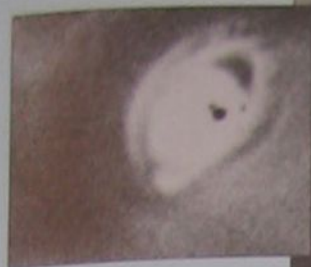
This film is so versatile that different applications are frequently discovered by users. It can be processed to give a wide range of contrasts, and effective speed ratings range from about 50 to about 125 ASA, so experiment is necessary for best results. The colour response is reasonably flat over all visible wavelengths to 690 nm. This means good mist-penetration qualities but poor flesh tones: the film is better for objects than for portraits of people.

The most exciting specialist film with unusual sensitivity is the infrared (IR) type. IR films are sensitive to blue light, because the makers cannot prevent this, but the dye sensitization extends through the visible spectrum and beyond to a wavelength of about 900 nm (the human eye can see up to 700 nm: see page 198). To achieve typical IR results, a filter is needed to absorb most of the visible light, which would otherwise swamp the IR sensitization. For scientific work or forensic subjects, such as the detection of forgeries, an IR transmitting filter is used, but for pictorial photography a deep red will suffice. Kodak High Speed Infrared Film 2481 with an IR (87C) filter has a nominal speed of 10 ASA, which is slow. Using an ordinary red filter, however, the effective daylight speed is about 50 ASA.

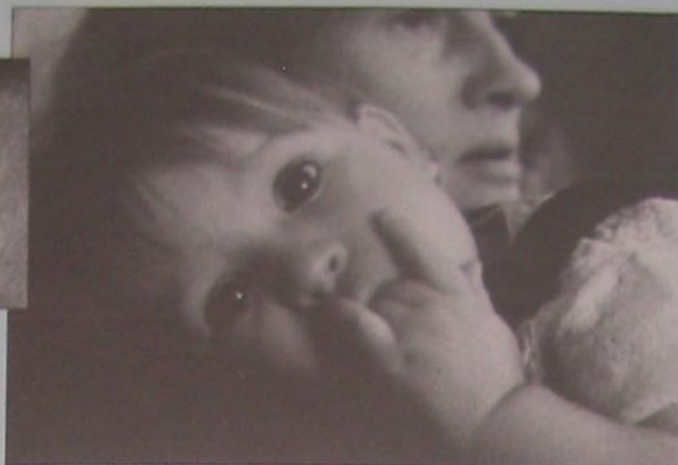
Infrared radiation does not come to the same point of focus as the visible light for which the lens is corrected (see page 1620). Most modern lenses have an IR focusing mark which enables you to focus normally and then turn the lens to align the IR mark with the focused distance.

IR films are most suitable for landscape and when the sun shines. Portraits are not pleasing, because the veins appear to stand out. IR cannot penetrate fog, but it will pierce through a light mist. Blue sky records as black, against which clouds show startlingly white. Grass and trees record as almost white, because chlorophyll reflects IR. Snow, water and ice are recorded as very dark. Tonal renderings are changed and the exact results cannot be predicted. Processing is normal, except that heating radiators are best switched off while loading the film into the tank. In fact, any form of heat is a source of infrared and is, therefore, likely to fog the film.

Bob Cross



Very high speed but less grainy than 2484. This film is rated at 1600 ASA and developed in HC-110



complete description, just in case the film specification has been modified.

An important recording film type is described as Rapid Access Recording (RAR). In the Kodak range a fairly widely available example is Rapid Process Copy Film. This is intended for copying X-rays in hospitals, where results are required swiftly. The film is processed at temperatures up to 54.5°C to achieve rapid results—a development time of just a few seconds is possible. This rather slow film, sold in 35 mm cassettes, can be processed in ordinary paper developer, and gives a direct positive image with no reversal stage.

Also in the RAR category is 2495 film. This is processed in an active developer, such as D-19 or HC-110. Some specialist films need developers, such as DK-50 and POTA.

One type of recording film is extensively used for surveillance—Kodak Recording Film 2475, which is particularly suitable for shooting in dim

Technical and recording films

IR films can also be grouped with the third broad film category—the technical and recording films. In fact, this category is difficult to define, and includes a large range of films that have a more general use. And there is no apparent connection between the intended use of a film and its index number. Kodak's 2497, for example, is a blue sensitive, high

contrast, fine grain, high resolution emulsion on a polyester sheet film, whereas 2495 is high speed and orthochromatic with high resolution. Although a film title, such as Kodak Technical Pan, helps to identify the film, it is safest to know the

Typical special effects of infrared high speed film 2481, with light rendering of vegetation

INFRARED



Dumbell nebula A photograph taken by an amateur astronomer through a 25 cm telescope using 103a-E film



interiors, floodlit arenas and under street lighting. It can be rated at speeds up to 4000 ASA with suitable development, but is very grainy and is unsuitable for portraits because of its extended red sensitivity.

Long duration exposures are essential for some types of astronomical subjects—such as faint stars and galaxies. Kodak's 103a-E is intended for exposures longer than 100 seconds.

For the amateur, specialist films can be too costly to use often. Even when some films are available from stock, they are expensive. Frequently, a photographer must load cassettes from a spool containing 15 m or 30 m of film. Load film yourself to cut costs.

Sports day

School sports days may appear to lack the gloss and glamour of top-class athletics meetings but, surprisingly, both must be treated in the same way



School sports day has the same appeal the world over, and offers a chance to photograph both the sports themselves and portraits of the children involved.

However, while the standards of the sports hardly compare with professional athletics, the photographic approach is largely the same in both cases—as professional sports photographer Nigel Snowden found when faced with the challenge while on vacation in Australia. Nigel explained: 'As is true of almost all sports, the main thing is to capture the peak of action moments. Whether shooting a child at the high jump or sprinting along a track, you have to concentrate on what is happening in the viewfinder and on releasing the shutter just when the competitor makes an anguished expression or reaches the climax of the event.'

For the high jump, Nigel concentrated a boy or girl just as they were midway over the bar. For a sprinting event he prefocused his 180 mm lens on the finishing tape and pressed the shutter just as the winning group crossed the line at the end of the race.

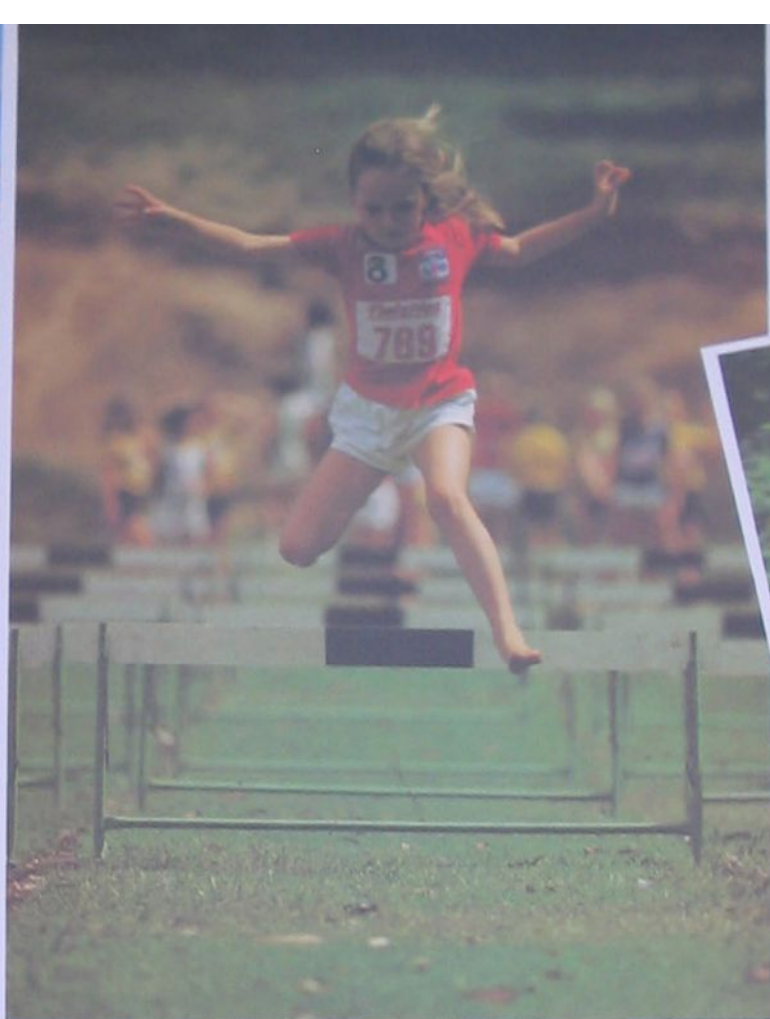
Nigel added, 'I always feel that it is very important to vary the shots as much as possible at any sporting event. As well as these more obvious shots, I also looked for unusual views of what was going on. Isolating the row of legs poised for the start of a running race is one example of this. With the long jump I also tried a shot framing a young spectator in the foreground with a competitor and her shadow clearly visible



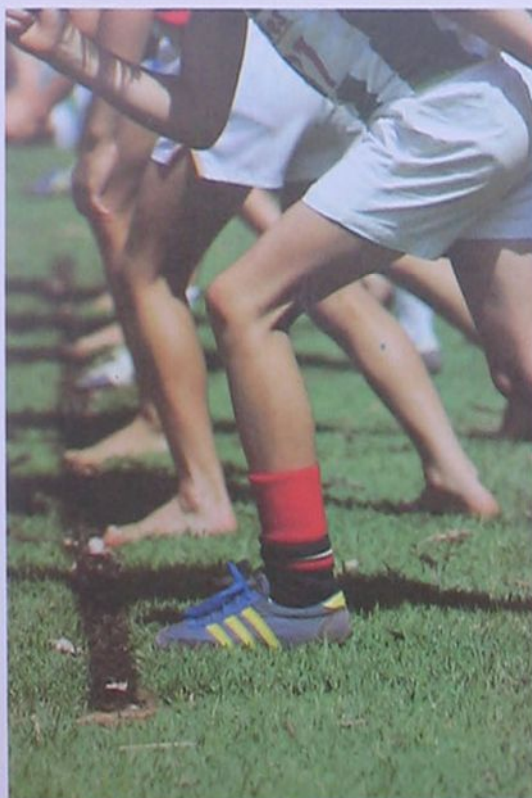
and caught at the peak of the action. A shot like this gives the viewer something extra to look at and also creates a stronger sense of involvement and interest when looking at the shot.

In the bright Australian sunshine there was no problem with using fast shutter speeds to freeze the action—even though Nigel was using Kodachrome 84.

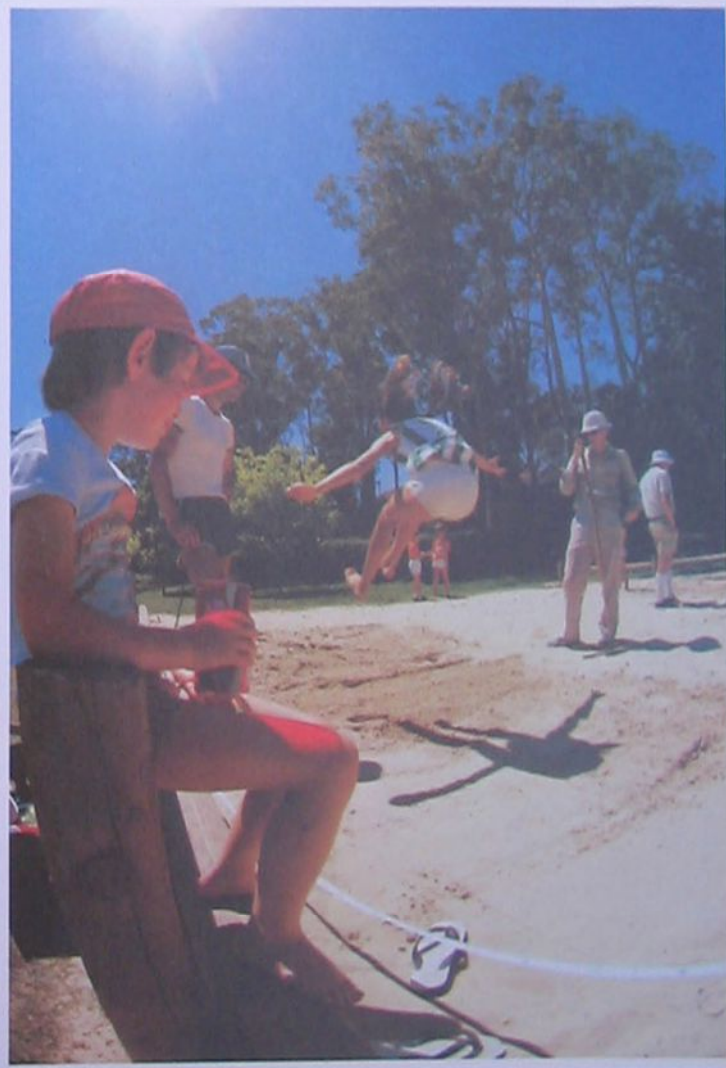
Most of the shots were taken using his Nikon F2 cameras set at 1/250 or 1/500 second. Although he made use of wide angle lenses as well, Nigel found that his trusty 180 mm f/2.8 Nikkor telephoto was the most useful lens to have. It allowed him to close in on the action as well and create interesting shots out of details.



Hurdling Often, there is more than one way to photograph an event. Nigel found that a head-on shot was particularly effective for hurdling while the side view tended to have less impact. The red vest also gave a more colourful shot



Wide view The characteristic distortion of a 16 mm full frame fisheye can be seen clearly in the sweeping view of the sports field. **Striped vests** Nigel was fascinated by the 'professional' appearance of the children and used his 180 mm lens to concentrate on this cheerful group of girls dressed for the occasion. **Starting line** A more unusual shot was created by using a 180 mm lens to isolate the row of legs poised for the start. **Long jump** Foreground interest creates a sense of involvement and gives a sense of depth



World of photography

FULVIO ROITER

From a Venetian street to a bar in South America, Fulvio Roiter's photographic subjects are presented with clarity and force. His images bring out an exotic beauty in the simplest of scenes

Photographs by Fulvio Roiter all have one thing in common: a sense of atmosphere. Fascinated from childhood by the beauty of exotic places, he captures their atmosphere in his books of photographs, each of which is a personal view of a country or a city. Over the years his unique approach to this kind of reportage has evolved into an unmistakable style.

Appropriately enough, Fulvio Roiter has lived most of his life in Venice, a city which combines the fascination of the East with lighting of a rare quality. For as long as he can remember, he has loved photography—he describes himself as 'born with a camera in my hand'. His childhood, in the 1930s, was spent in a small village near Venice—his godfather was the village photographer. One of his earliest memories is the fascination of playing with a camera, and he vividly remembers how as a child he used to love even the smell of the film emulsion inside a camera.

By the age of 15, he had photographed everything and everybody in his village. It was wartime, and Italy was under German occupation—bombers flying overhead provided him with a new subject for photographs. One day, he remembers, a crippled American plane circled over the nearby fields, dropping out dozens of parachutists. Knowing that they would all be taken prisoner, Roiter went to the German headquarters in the village, in the hope of grabbing some unrepeatable shots. As the captured men were escorted into the village square, Roiter took out his camera but it was immediately snatched from his hand and confiscated.

Crestfallen, Roiter told his father of the incident. A regular customer at the village café patronized by the occupying Germans, his father was able to identify the officer in question. That evening,

Venetian café
Always one of Roiter's best loved subjects, the carnival in Venice provided him with this unusual image. These disguises seem even more incongruous in a café setting

after plying him with numerous glasses of 'grappa', the local brandy, he was able to retrieve the camera from the officer's pocket. 'After that,' Roiter recalls, 'I didn't dare show my face in the village with that camera round my neck!'

After the war, Roiter joined a photographic club in Venice, called 'The Gondola'. These were his formative years. He met a former businessman turned photographer—Paolo Monti—who became his mentor. Much of their time was spent together, comparing results and discussing possible approaches. He commuted regularly from his home village into Venice, bringing

all of his pictures and seeking advice from the other members, who were mostly older than he was. His work, however, was usually the most original—he went out of his way to capture unusual images, getting up at dawn to photograph misty landscapes, or climbing up railway signals to photograph trains enveloped in smoke.

For five years, from 1948 to 1953 he frequented the Gondola club—a period he now regards as his apprenticeship—without succeeding in publishing any photographs. Eventually, his father gave him an ultimatum, telling him that he would have to find proper work. Then, out of the blue, a leading magazine

Fulvio Roiter





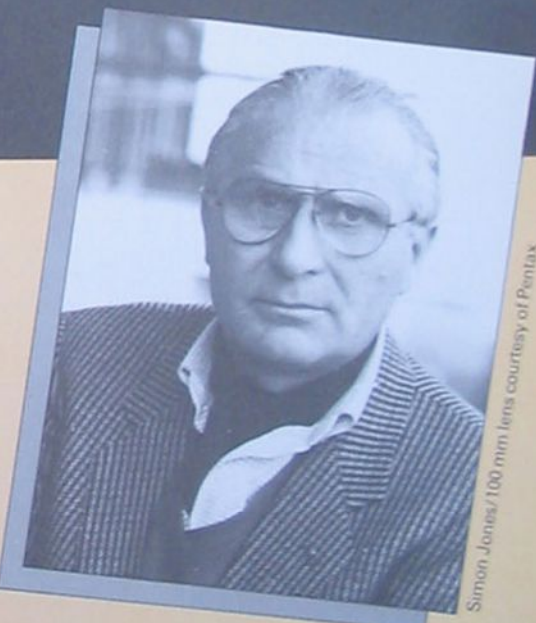
published one of his photographs. This inspired him to ask his father for one more chance. He borrowed a Rollei camera and a bicycle from a friend, and rode around Sicily for two months, taking hundreds of photographs. Some were published, and from then on he never looked back.

A publisher in Switzerland, La Guilde du Livre, agreed to publish a book of his photographs of Venice. Roiter recalls: 'I was lucky, because they did this purely on the strength of the pictures of Sicily. I didn't have a single one of my old Venice pictures left, but when they gave me a picture deadline, I worked night and day, and had 200 ready in time!'

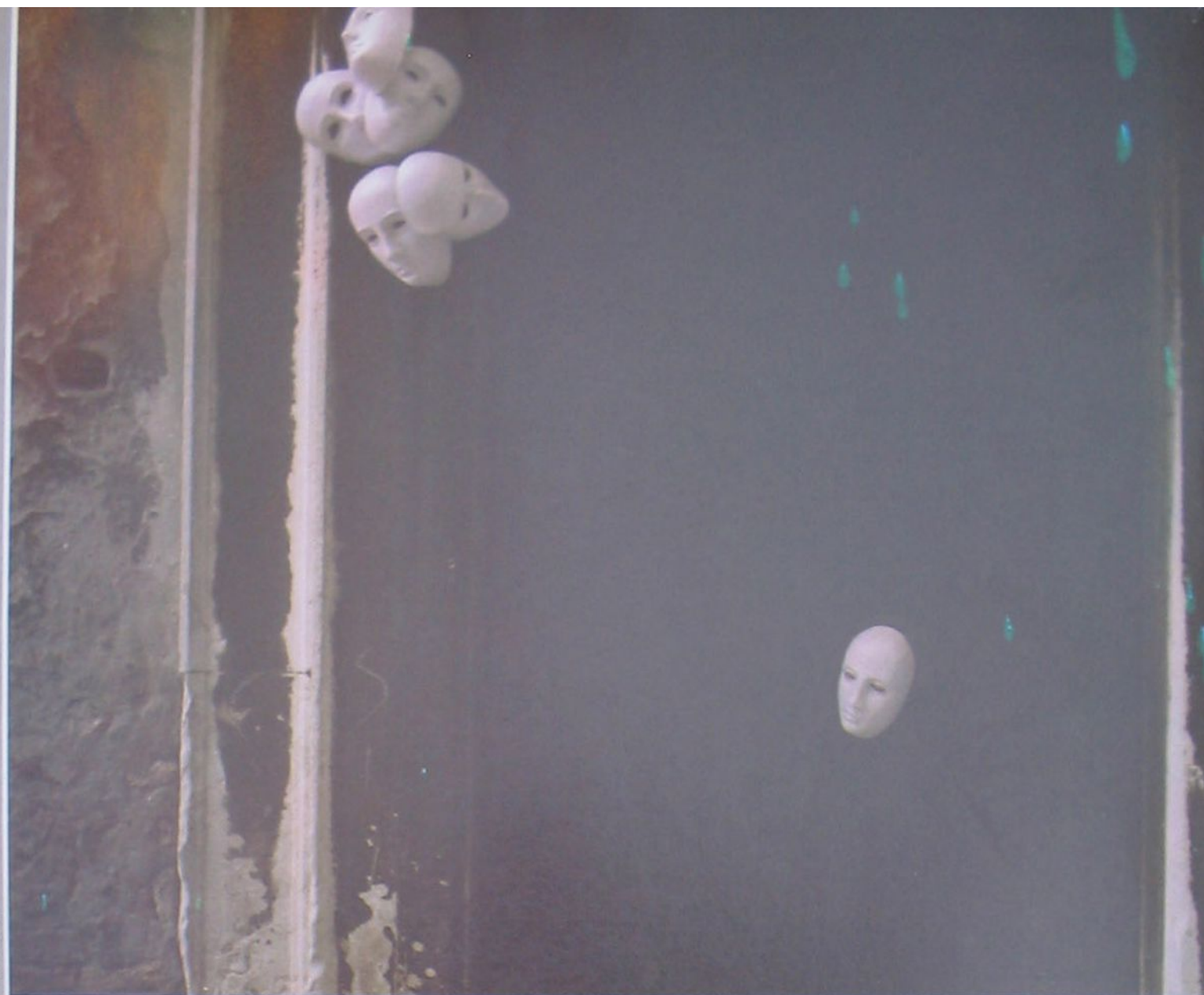
When the book was eventually published, he was horrified—he had had no say in the layout, and his shots were printed next to quotations from poems which he found inappropriate. He felt then, and still does, that a photographic image should speak clearly for itself, without the need for any words.

Unusually for a photographer, Roiter works almost exclusively for books and, after the Sicilian book, his next project was *Ombrie, Terre de Saint Francois*, a book published in 1965 containing a dreamy, pastoral collection of photo-

Fulvio Roiter 'The important thing is that a photograph should speak clearly'



Simon Jones/100 mm lens courtesy of Pentax



graphs of central Italy, land of St Francis. In 1957 he brought out another about Andalusia in Spain and, surprisingly considering his views on the value of words, this was accompanied with poems by Garcia Lorca and other Spanish poets—Roiter concedes that occasionally the right quotation in the right place can help a photograph.

That same year, Roiter reached a turning point in his life—he made a nine month journey to Brazil for a book he had been commissioned to do. This was the first time he had ever left Europe, and it made a lasting impression on him. He was fascinated by the care-free, human warmth of the people, as well as by all the contradictions and contrasts of the place. He was determined to try to show the unknown side of Brazil, not the preconceived European idea of a land of sambas, carnivals and sandy beaches. He was present at the inauguration of Brasília, and the first mass celebrated there. Throughout the trip, he attempted to produce an original and synthetic view of a country he found too vast to comprehend.

When he puts a book together, Roiter takes a great deal of time on the sequence

and balance of the material he presents. He feels it is useless to publish an amorphous mass of photographs, however interesting. As a rule, he works from the general to the particular, starting with an overall view of his subject, then concentrating on details.

One of his recent books on Venice, *Essere Venezia*, is put together in this way. The first impression, at the beginning of the book, is one of arrival—the city seen from afar. The photographs then lead the reader through the crowded, colourful streets of Venice, and the book ends, once again, with distant views. The photographic journey is over, and Venice is left behind, receding over the horizon.

The book has sold 200,000 copies throughout the world. Roiter attributes this above all to the use of colour—he does not feel that black and white photography has much commercial significance—but also to the book's format: it is elongated horizontally, to fit the shape of the 35 mm negative.

Throughout his work, Roiter has tried to achieve one basic aim—what he calls clarity of photographic 'language'. Any image should speak for itself, clearly,

Masks Always on the lookout for odd or amusing touches, Roiter caught this shot in a Venice backstreet during the carnival. **Loaves** The simplest of objects can attract Roiter's attention—here, he has used texture and lighting for a striking shot. **Fireworks** Taken during a Venice festival—Roiter used a longer exposure to produce this atmospheric and very dreamy effect

without requiring any explanation. His photographs bear this out; they are immediate, and make use of no special effects. Though he dislikes tricks, he believes that the photographer must manipulate the subject to achieve a striking image. It is not enough to simply look for striking subjects, the photographer must add something to the subject. He criticizes many war photographers, or those who produce documentaries of certain kinds for cheap sensationalism. 'A dog with a lens in its mouth would bring back the same pictures' he shrugs. He does not see any point in presenting the spectacle of human suffering for its own sake, or simply to create a stir.

The real skill in producing a docu-

mentary for Roiter, lies in turning an apparently commonplace subject into a meaningful photograph. He quotes W. Eugene Smith and Lewis Hine, pointing out that their work is beautiful in a sense, as well as being a record of history and social conditions. The key to a successful photograph lies in a careful balance between impact and harmony. It is better, he feels, to suggest something than to present it crudely, saying the photograph's message out loud.

For this reason, Roiter has often been accused of 'beautifying', and ignoring the significant, if less pretty, side of life. This too he rejects—for Roiter, beauty is necessary, and a fundamental character-

istic of his work. Very often he shoots the same subjects over and over again, and he has hundreds of similar landscape shots among his photographs. Many of these are of subjects often classed as banal or clichéd. 'It doesn't matter what you photograph, it's how you do it that counts. Even a sunset can be original if you photograph it properly'.

He does not recognize any one major influence on his work, but feels that perhaps an important factor in his development was the peculiar light of Venice. The unique combination of mist and sunlight, with the resulting soft colours, is a quality which often appears in his photographs. But one photo-



Fulvio Roiter





Bunch of dates Roiter was fascinated by this Tunisian girl, but had to follow her for some time before she would allow herself to be photographed. Notice how the golden colour of the dates reflects the desert sun

Rice paddy Travelling through the Ivory Coast, Roiter caught sight of this small boy, transplanting young rice plants from one field to another. He used a 21 mm lens for strong perspective

No hurry Shot in a bar in Mexico, this candid photograph has a mood reminiscent of some of Cartier-Bresson's work. The overall colour of the light is blue, conveying the feeling of cool shade, and the men's pensive mood





grapher whose work he admires very much is Bischof, whom he feels also had a clear photographic 'language' or style, and also produced beautiful images.

Roiter does little other photographic work, apart from the books he is commissioned to do, but he has occasionally done some advertising. He only accepts work for an advertising assignment if he feels that he can produce some interesting photographs. One advertising campaign he was involved in was for Renault cars of France. 'At first I thought it was a mistake when they telephoned me, because nothing could be more different from my style of photography than car shots. But they seemed to think I was the right man for the job.'

'We spent two weeks travelling up and down Burgundy, looking for locations. I wanted to produce a photograph which would strike the viewer, before he even realized it was an advertisement. Eventually, we edited all the material down to three transparencies. We projected them at the advertising agency—one of the three slides was being projected, when a secretary walked into the room. She gasped when she saw the photograph! That was the effect I wanted, so we chose that shot out of the three'.

This type of work, however, accounts for very little of Roiter's total output. He has never done any studio work, either. 'I am afraid of the degree of technique required to take photographs in a studio. I admire those who can, for instance, produce a stunning photograph of a couple of glasses, just through clever use of lighting, but I could never do that myself'. He also does a minimum of portraiture, con-

fining himself to those photographs he feels are indispensable in a reportage because they make a point about the people of a particular country.

Roiter has always used Leica cameras for all his work. He finds the lenses second to none, and the quality of engineering superb. His special love is the Leica rangefinder, which he feels is the ultimate camera. 'Even the click of the shutter is music to my ears, and the camera itself is so delightful to hold'. When using the rangefinder, he takes only one small bag, a Leica M4-P and 35, 50 and 90 mm lenses.

For colour work, though, he finds the rangefinder unsuitable because of the long lenses he has to use, so he uses Leica reflex cameras. His travelling outfit, which he takes on all assignments, consists of three Leica R4 bodies, with 21 mm, 24 mm, 35 mm, 90 mm, 135 mm, 180 mm and 400 mm lenses. Most of this fits into one aluminium case. He especially likes the fast lenses made by Leitz, as they allow him to use slower films. When he can, he uses Kodachrome 64. In poor light, he changes to Ektachrome 400, although he finds this gives poorer quality. When he can, he uses a tripod, even with wide angle lenses.

Recently, Roiter has become more interested in photographing people, and has published a book on the Venice carnival. The book is a collection of images which are both bizarre and nostalgic — the ancient traditional characters of the carnival set against the background of historic Venice. It is typical of Roiter's fascination with the exotic. A writer friend of his once said of him: 'The 20th century does not exist for Fulvio; he goes on his way, in search of a lost secret...'.

Testing your enlarger

An enlarger and its lens are important parts in the making of prints. Poor quality components at this stage wastes the potential of top-notch photographs and equipment, so check your system with these simple tests

The performance of a top quality camera lens is quite wasted if you use a poor quality enlarging lens to print the results. Testing an enlarger lens is quite straightforward, and is a very useful exercise if you are anxious to get the most out of your enlarging—it may help you decide if a replacement lens is necessary.

Very few enlarger lenses come close to matching the lens performance of even fairly modest camera lenses. Even so, you should try and spend as much as you can on a lens of the appropriate focal length (see pages 1254 to 1256).

Unlike camera lenses, enlarger lenses are designed for specific conditions of use. In a nutshell, they give their best only when used at a specific aperture and degree of image magnification, conditions of use which are clearly spelled out for top quality lenses.

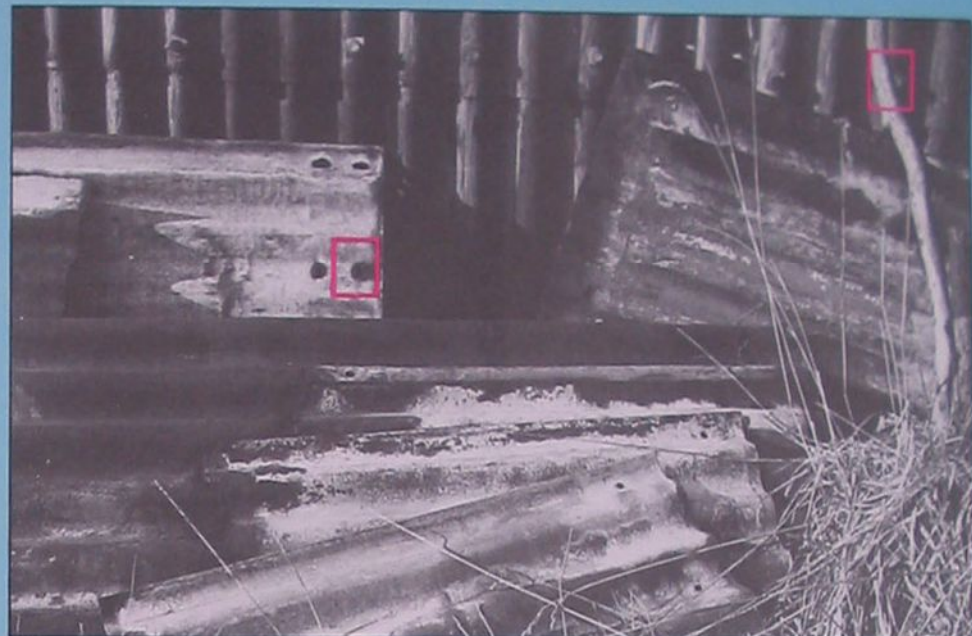
Most 50 mm enlarger lenses—especially the cheaper ones fitted to amateur enlargers—tend to be designed for use in a magnification range of up to $\times 10$, giving prints up to 25 \times 35 cm from the full area of a 35 mm negative. Lenses of slightly longer focal length, 75 mm and 80 mm, used for printing 120 size negatives, may be corrected to $\times 5$ magnification (or less) to give the same 'average' sized enlargements.

If you regularly use roll and 35 mm formats, and you have enlarger lenses to suit both, you may find it worthwhile to run performance checks between the two at various magnifications, between the extremes you are likely to use. In this way you can be certain what each lens is capable of, and whether or not it would be worth switching the lenses around at some magnifications.

You may, for instance, find that a 50 mm lens gives better quality sectional enlargements than a 75 mm beyond a certain degree of enlargement. Conversely, the longer lens may be more suitable for mini-enlargements made from 35 mm negatives.

Even if you have only one enlarger lens, a test sequence can provide valuable information on what apertures as well as what degrees of enlargements give you the best quality prints.

It is well known that you should not use an enlarger lenses at its full aperture, because stopping down can improve sharpness quite substantially. Although in a practical sense this is largely the result of improved depth of field, using smaller apertures can correct inherent spherical aberration. This is particularly the case with inexpensive enlarger



lenses, which are designed more with an eye on costs than performance. But if you stop down a lens too much, diffraction effects reverse the trend and severe loss in sharpness occurs. Thus most enlarger lenses are designed for use in the middle range of apertures.

An $f/4$ enlarging lens may offer six or more click-stopped settings down to a minimum aperture of $f/16$. If you discount full aperture and use this simply for focusing—and discount the 'token' minimum aperture—the four or so remaining settings still offer a seemingly worthwhile range. And you can easily test for yourself whether one of these proves better than the rest. You can also decide whether or not the improvement offered by one aperture justifies the inconvenience of a too long or too brief exposure offered by another.

Testing procedures

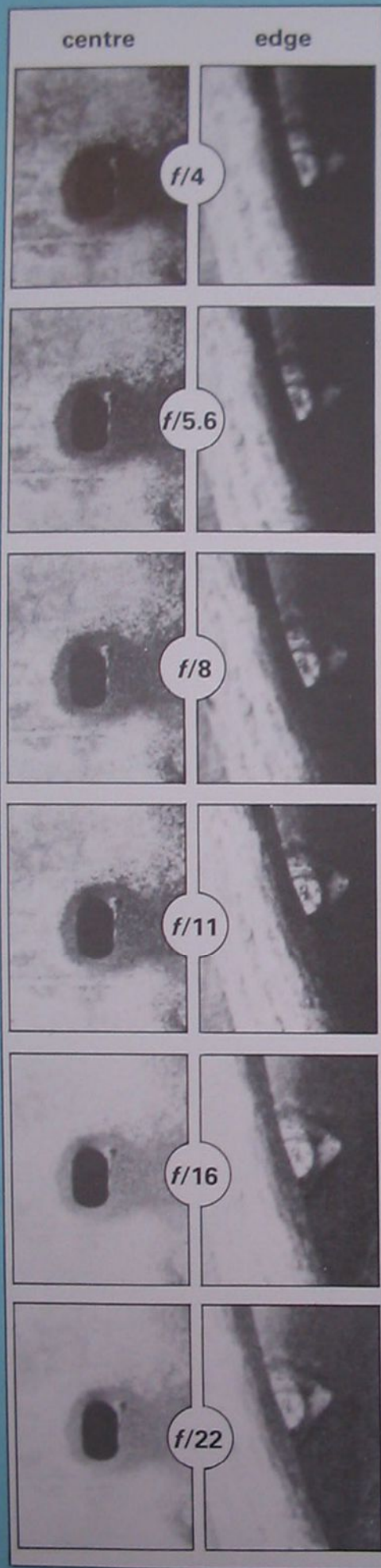
Any test procedure is as much of a test of the system as it is of the individual component under examination. So, to be perfectly fair, especially if you are making comparisons between lenses, all possible variables must be kept as constant as possible—especially where exposure and processing are concerned. This is particularly true if you are conducting tests in colour. Make notes so that you can accurately record performances for future reference.

The test negative you use rather depends on what sort of testing you want to do. Any normal contrast—and sharp—negative is adequate for a general

Test negative A bitingly sharp image with a good range of tones makes an ideal test negative for evaluating the performance of your enlarger lens. Take test prints at each aperture to test both edge and centre performance, at the image magnification size you are most likely to use. The sequence right, printed at $\times 10$ magnification but reproduced at $\times 20$, shows how a typical enlarger lens offers differing standards of performance across its range, with the best quality in the middle of the range

check on image contrast, possible image distortion, and all-over frame sharpness in cases where the grain pattern is visible. But for definitive comparisons, a specially shot test negative would prove useful. This could be of any static everyday object—a picture of a brick wall would perhaps be ideal for testing for any image distortion. Or you could photograph a commercially available lens test chart using, in each case, your best camera lens, careful photographic techniques (see page 1094) and a fine-grain film and developer combination to get the best possible image quality.

To minimize unsharpness caused by curling of the negative, it is best to mount the test negative between very thin sheets of glass, such as used in many larger negative carriers. Or you can use specially cleaned flat plate glass for this. If you have a 35 mm enlarger which is normally fitted only with a glassless negative carrier, try re-



placing the complete holder with a simple glass-negative-glass sandwich. You will almost certainly have to tape blinds or baffles to eliminate stray light that the enlarger's proper negative carrier would cut out.

Focus the test lens at full aperture, at the image centre, then make a set of prints, of appropriate size and on a normal contrast paper, covering the range of apertures you wish to test, first at the smallest enlargement size you normally use, then at the largest. Prints made at more extreme magnifications could also be helpful. The prints themselves should be large enough to show edge to edge performance across the field of coverage.

You may find it better to use a number of small-sized prints in place of one large sheet at big enlargements. Make notes as you proceed and, to avoid later confusion, number or otherwise mark the print edge or back in some way to correspond with your notes.

Consistent print exposure is essential for meaningful comparison of prints—it is therefore better to rely on an enlarger meter if you have one. Otherwise double exposure for each full stop you close down, and allow generous additional exposure for the smallest apertures to counteract any low intensity reciprocity failure which can be a real problem when very long exposures are used. Such a doubling-up series will, moreover, check the accuracy of the aperture series for future use.

Interpreting the result

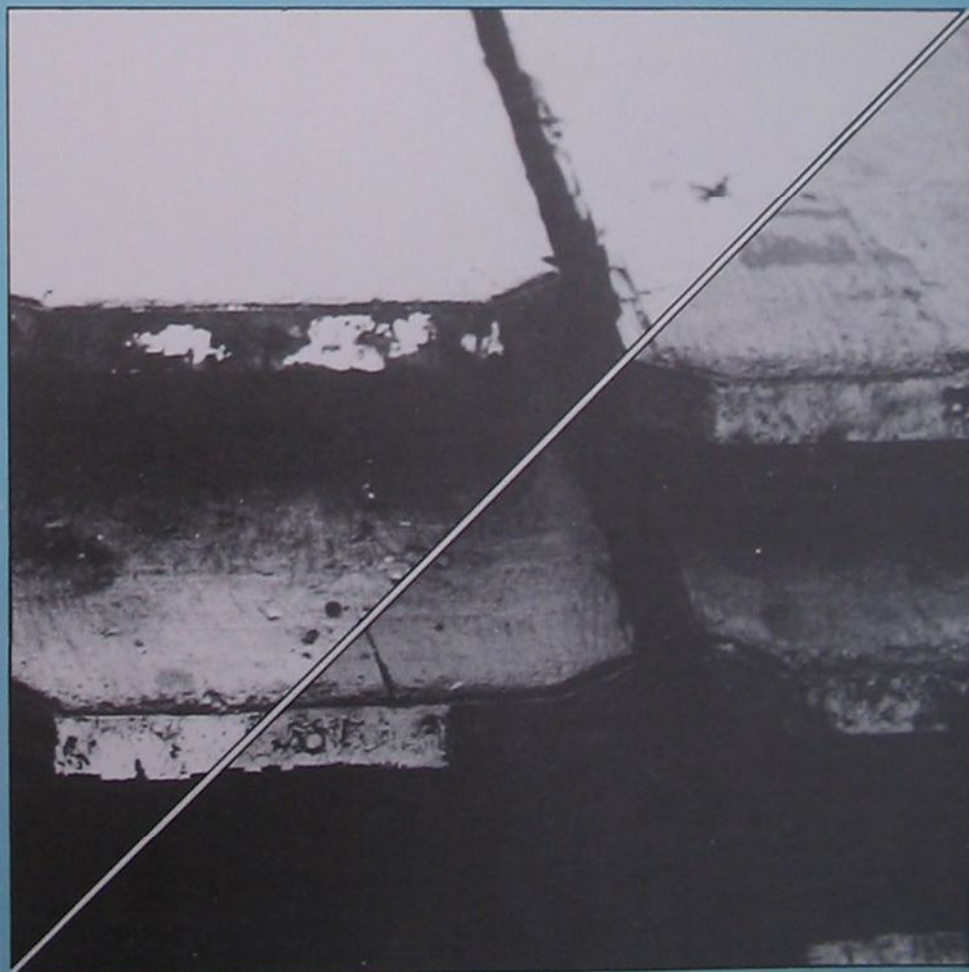
After processing, compare the prints for sharpness and contrast. You can check the performance of an individual lens by examining the image at the centre and edges of the field on prints made at each aperture.

Ideally, sharpness should be even across the field regardless of aperture. But, usually, central performance is noticeably better throughout the aperture range. Look for the mid range aperture setting which gives the most satisfactory overall sharpness, and use this for future full-field enlargements.

If your lens is cheaply designed, badly constructed or damaged, various performance faults may come to light. Check first to see whether any focus shift occurs when you stop down by comparing the central parts of the image on prints at full aperture and stopped down. If this uncorrectable fault is noticed, it means you have to refocus after stopping down.

Next check prints for overall sharpness. If one half is sharper than the other this could indicate that your lens's optical axis is out of line with the lens mount. Before assuming that it is your lens at fault, check to see that the negative, negative carrier and lens mount

Contrast and sharpness The impression of image sharpness is heightened if you print on contrasty paper, or use a high contrast lens (left) rather than a high resolution lens (right)





Chromatic aberration *If your enlarger lens produces colour fringes like those on the white gable, your lens has chromatic aberration—an incurable fault that afflicts some enlarger lenses*

are all parallel to the enlarger base-board as any one of these out of true can lead to similar unsharpness. If your lens proves faulty, it would be best to replace it unless sharpness improves at the middle range apertures. The same applies to lenses which display peculiar characteristics such as concentric circles of differing sharpness, which may vary according to the aperture used.

The impression of sharpness really depends on both the resolving capability or resolution of the lens and the image contrast it gives. Whereas resolution can be assessed purely on whether or not an image—even its grain—records sharply, image contrast cannot be judged quite so easily and objectively.

Cheaper lenses tend to rely rather more on contrast than resolution for sharpness. Their performance can then only be judged subjectively, or by comparing results with a lens of known quality.

When finally assessing lens sharpness, bear in mind the fixed limits which are imposed by the negative and print materials you use. Generally, you need better quality lenses for printing images on film—with its better resolving capability—than you do for printing on ordinary paper. A good lens also enables you to get the most out of a good, sharp negative.

Other tests

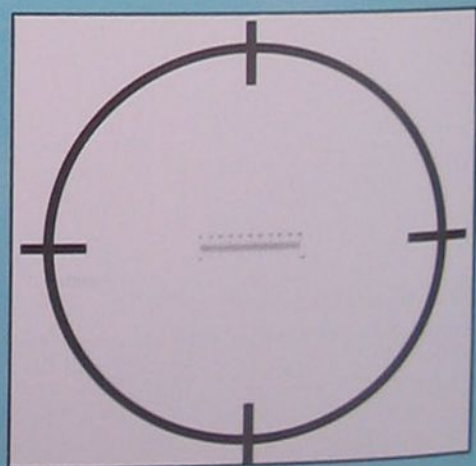
Good quality lenses are especially important in colour printing—a cheap lens may not be adequately corrected for chromatic aberration. Using a suitable colour test negative or slide, make a single print, at your normal printing aperture. The most appropriate are those with clear divisions between black and white, such as railings or window panes. After processing, examine the colour focus of the image with a magnifier. The presence of colour fringes or, in the worst cases, visible separation of the colour components of the image suggests the presence of chromatic faults. Such a lens is of no use in colour printing as even stopping down cannot bring about any improvements. The lens may, however, be suitable for black and white printing as only the blue part of the image will be recorded on blue-sensitive paper. You may experience problems with multigrade paper, however.

If you make colour prints regularly, you may be interested to test the colour change introduced by progressive stopping down—a warning tendency in some cases. This may explain the presence of casts that occur when test print exposures are made by adjusting apertures rather than exposure times.

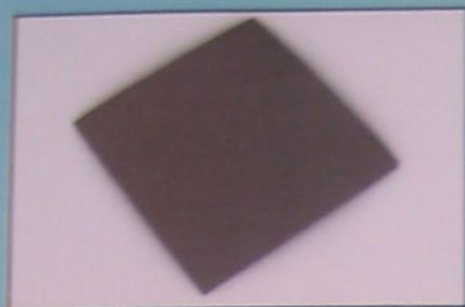
If you use an analyzer, such deviations are automatically corrected when filtration readings are taken. But such a 'fault' cannot be blamed on the lens—it is merely the result of lengthening exposure time and the reciprocity effects on the paper.

Flare can be another problem, and can be checked simply by printing a pinhole made in black card in place of a normal negative. The slightest trace of grey around the black spot that results, indicates flare. You may even be able to see flare in the baseboard image, without making a print. But check first that dust, condensation or fingerprint marks on the lens are not the cause.

For definitive resolution tests of lenses special test negatives have to be produced. A typical medium speed film has a resolving capability of about 100



Test graticule *Although primarily intended for microscopy, a measuring stage graticule such as this one, with one millimetre in one hundredth divisions, makes an ideal test 'negative' for testing a lens's resolving capability. An enlarged scale is shown above*



Flare To test for flare, make a pinhole (above) and print it. A good lens yields the print at far right, while one with flare gives a poor result (near right). **Illumination** A test print (below left) and an actual print (below right), showing the presence and effects of uneven illumination.



Bob Cross

Enlarger illumination

Although taken very much for granted, the quality and nature of enlarger illumination plays an important part in printing. Condenser systems are the most vulnerable to misuse, and it is important to match these up to the enlarger lens you are using. Many types of enlarger have some provision for lamp adjustment and the maker's instructions should be closely followed when, for instance, changing lamps.

You cannot assume that the illumination on the baseboard will be even right to the corners of the negative areas covered by the lens. This is optically impossible in any case and would be quite undesirable, even if possible, as all negatives are thinner towards the corners than on the axis of the lens. Typically—and ignoring possible vignetting by the enlarger lens—the illumination at 20° off the axis will be three-quarters of that on the axis. But what is unacceptable is a noticeable variation in illumination across the field.

A simple test is to make a print without a negative in position—but use a negative to focus the lens first. As exposures can be very short, use a neutral density filter in the negative carrier, or print through a frame or two of clear, unexposed but processed film taken from the start or end of a roll. Aim for an exposure which gives you a pale grey print image. Use a normal grade of printing paper for the tests as a very hard grade will give a result that is markedly lighter towards the edges than in the centre. Also test print a typical negative of an evenly lit subject. Without

having to resort to dodging, the corners of the print should be no lighter than the middle. But it is worth noting that, with some enlarging lenses, there may be excessive and obvious unevenness at full aperture which disappears on stopping down—in some cases by a stop or less. If the illumination remains uneven the enlarger lamp may be wrongly positioned or a condenser of the wrong focal length may be fitted for the focal length of the lens in use.

Adjustments can be made visually by focusing the lens on to white card (preferably at the enlargement you are going to use), then by centring the visible hot spot and focusing the lamp until an even as possible rectangle of light results. But make a test print to be certain lighting is even.

Such adjustments are not necessary for a properly set-up diffuser illumination system but it is still worthwhile checking evenness in cases where a lens may be mismatched to a particular diffuser. This can be checked simply by printing the illumination field without the negative carrier in position—but use additional baffling to cut out stray light. Such a test can tell you whether it is possible to use, say, a 75 mm lens on a diffuser system really designed for 35 mm negatives and a 50 mm lens.

At the very least, this test will show you how much of the field of view of a longer lens can be used safely with that illumination. This may enable you to print a fairly large area from a roll film negative, using a longer lens, without having to change a special 35 mm illumination system.

lines per mm (see page 1074) and any test negative should mirror this. Because of the difficulties involved, it is considerably easier to bypass a conventional test negative and use instead a measuring stage graticule. These are normally used in microscopy and are available from those supply sources. These graticules are produced microphotographically and are conveniently mounted in glass slides.

A typical graticule scale may be a millimetre clearly ruled in one hundred parts, and costs about the same as a box of 50 sheets of black and white A4 paper. Used in place of a negative at $\times 10$ enlargement, the whole scale would measure only 10 mm when printed—and the divisions of the scale would be a real test of a lens's resolving capabilities. Prints could be made with the scale arranged to fall at the centre or edge of the lens's field. Keep exposure short or the scale image will be overprinted, or fogged by the surrounding black image.

Colour response-3

With modern colour films, the accuracy of colour response depends not only upon the sensitivities of the three emulsion layers but also upon the colour of the dyes that form the image

Integral tripacks based upon subtractive principals are now firmly established as the basis of all in-camera colour photography (see page 1440). Over the years, various extra emulsion layers have been added to the basic three to give fast, high quality emulsions, and modern colour film is both easy to use and extremely versatile. Nevertheless, certain inaccuracies in colour response remain.

With additive processes the colour response depends largely on how each of the three emulsion layers reacts to different colours as the exposure is made—that is, the film's *spectral sensitivity*. With the subtractive processes used in modern colour film, however, the use of dyes formed during processing to display the image brings a second factor into play—*spectral absorption*. Spectral absorption is, essentially, the way the image dyes affect light coming through the film. This controls how we see the final image.

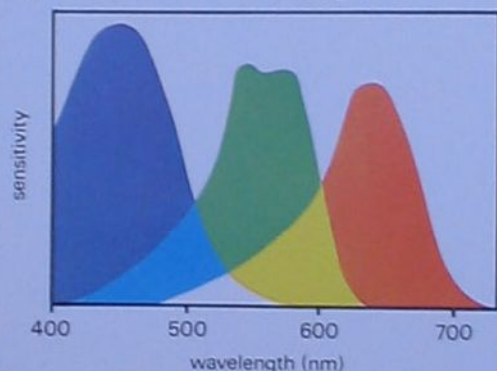
Spectral sensitivity

The sensitivity of a colour film can be measured either as characteristic curves or on a *wedge spectrogram*. Characteristic curves for colour film are similar to those for b & w (see page 1518), except that a separate curve is made for each of the three emulsion layers, showing the densities produced in each layer by a range of exposures. The wedge spectrogram shows how strongly the film reacts to different colours or wavelengths of light measured in nanometres). The *characteristic curve* for a colour film shows only the response of the layers to all colours of light; it does not show variations in response to individual colours in each of the layers. For slide film, the slopes of the curves are steep in the straight section for all three emulsion layers, indicating the high contrast that slide film gives. In the



Bluebells Because colour film has unwanted sensitivity to infrared, blue flowers can look slightly pink

Spectral sensitivity



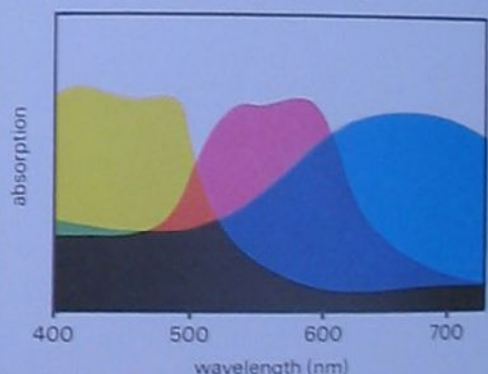
straight section, the response of each layer is virtually identical, and it is only deep shadows that show significant discrepancies. In the shadows, the colour response becomes slightly biased towards blue. Fortunately, this is rarely important because the eye rarely pays much attention to colour inaccuracies in the shadows. Accurate colour response also fails at very long exposures due to reciprocity failure (see page 464). In very bright highlights, manufacturers have attempted to keep colour response similar in all three layers because it is most noticeable here, but saturation is poor in all three colours.

Basically, then, slide film gives consistent colour within a narrow brightness range of

10:1—beyond that range performance tends to falter. This means that if you want good colour you must stick to subjects with a fairly low brightness range. Slide film will not tolerate much under- or overexposure.

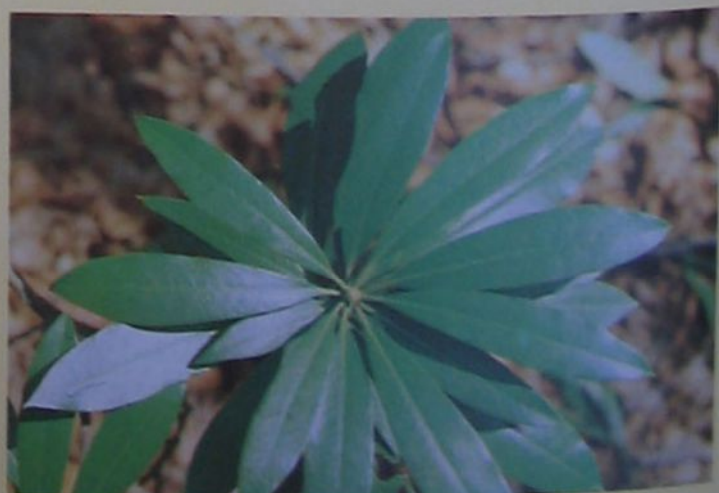
The characteristic curves for colour negative films basically mirror those for slide film and the strengths and limitations are similar. However, there are a number of differences. The straight slope, for instance, is slightly gentler. Although this might suggest that negative film can handle a greater brightness range, it is ultimately limited to a similar range to slide

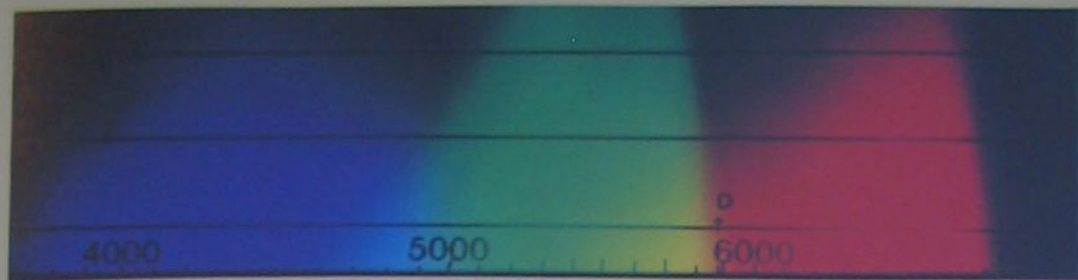
Spectral absorption



Wedge spectrograms show the colour sensitivity of the three emulsion layers (left) and the absorption pattern of the dyes that form the colour image

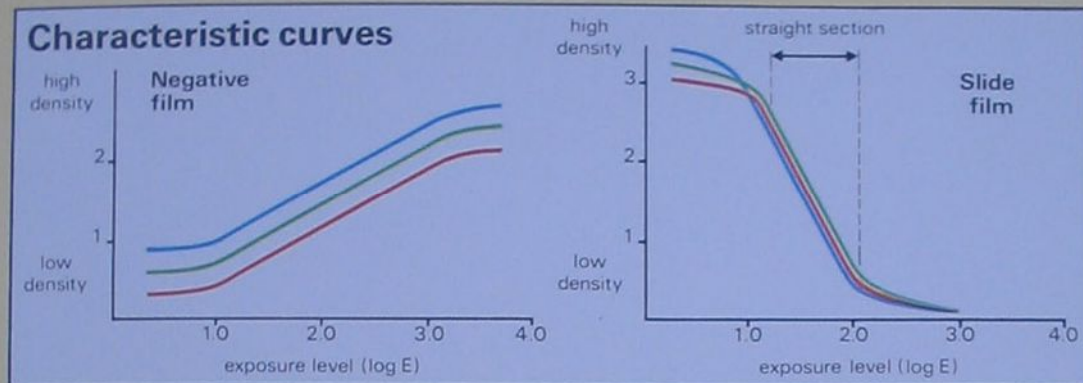
Leaves Colour response can vary considerably between films. Kodachrome (right) gives greens that are more yellow than those with Ektachrome (left)





Colour wedge This is a photograph from which a spectrogram is drawn up. It was taken by photographing a spectrum through a grey step wedge that darkens from bottom to top

layer but also the red sensitive layer. This means that blue flowers often appear slightly pink. Similarly, stars that appear green to the naked eye often appear red on film because the eye cannot see the strong, deep red radiation that the film records. Filters cannot be used to correct these deficiencies because infrared filters also affect visible as well as invisible light.



Characteristic curves show the densities formed in each layer by various light levels. For both films, response in each layer is similar only within a limited range (the straight section)

film by the paper it must be printed on to. A point to bear in mind is that the slope for negative film must be similar to that for the paper. If it is not, contrast in the film and contrast in the print will be different. This could give one colour bias in the shadows and a different bias in the highlights.

The most noticeable difference between the curves for negative film and the curves for slide film, though, is that with negative film, the blue, green and red curves show different sensitivities. Although identically shaped, the green curve is higher up the density scale than the red curve, and the blue curve is higher still. This is because

the blue and the green emulsions must give denser images than the red to allow for the amber film base of colour negative film—so that when printed, difference in densities is cancelled out by the amber film base (though sometimes it can lead to a red colour cast in shadows). **Wedge spectrogram.** Characteristic curves show up some of the features of the spectral sensitivity of colour film, but do not give the whole picture. The wedge spectrogram gives a different impression.

One feature that is immediately obvious on the spectrogram is the overlapping sensitivities of each emulsion layer. Thus, the blue sensi-

tive layer responds not only to blue light but slightly to green as well; the red layer responds to green as well as red; while the green layer reacts to both red and blue. This is partly because of the deficiencies of the dye sensitizers and the yellow filter layer, and partly because of the need to ensure full coverage of the spectrum.

The result is that colours are never pure—traces of other colours are always included. Since a mixture of every colour gives white, the effect is to desaturate colours, particularly greens. Sometimes, manufacturers arrange for the three emulsion layers to have spectral sensitivities that give steep, narrow peaks on the spectrogram. This improves saturation for most colours but leaves a few colours poorly catered for.

One other defect in the spectral sensitivity of three colour emulsions is the fact that emulsions respond to light outside the visible spectrum. While the sensitivity to ultraviolet light can usually be reduced by the use of ultraviolet filters, deep red and infrared light can be more of a problem. Blue flowers, for instance, usually reflect a little infrared as well as blue so the flower is recorded not only in the blue

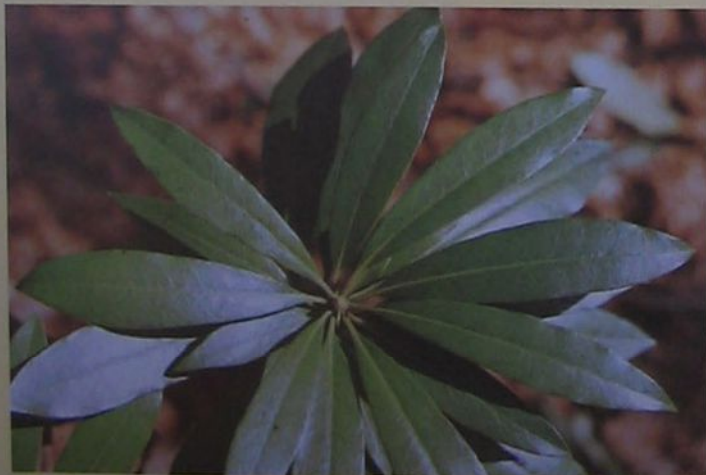
Spectral absorption

Although there are clearly a number of shortcomings in the spectral sensitivities of all three colour emulsions, they generally perform well in this respect within certain limits. However, it is the problems of the spectral absorption of the yellow, magenta and cyan image dyes, problems peculiar to subtractive processes, that present the photographic chemist with the most significant problems.

Image dyes are constantly being improved and at any one time, one manufacturer may produce a film that gives good greens while another is renowned for its reds. Nevertheless, there are some problems common to all films.

On the whole, the yellow dyes are good, but the magenta and cyan layers absorb some colours that they should not. The magenta dye should only absorb green but it absorbs a little blue as well. The cyan dye, on the other hand, absorbs not only red but some green and blue as well. So while yellows and reds are generally good, greens, blues and purples are often rendered badly. Mauves and turquoises, in particular, tend to come out rather pinkish or too dark. It is worth avoiding these colours if you can.

Clearly, then, the colour response of modern colour film is far from perfect: it has many limitations that prevent it from giving accurate colour in every situation. Nevertheless, it remains eminently practical and, providing you take the necessary precautions, it will usually give more than acceptable colour. Indeed, deficiencies in colour response are often unnoticed simply because the viewer rarely has the opportunity to compare the picture directly with the original scene.



Robin Scagell



Creative approach

Water

Whether the subject is a magnificent lake at sunset or a street puddle in the pouring rain, water can be an impressive element to include in your photographs

Water is a subject which fascinates everybody. People will stare for hours into a lazily meandering river, walk long distances to see waterfalls, and delight in the babbling of a mountain brook. After all, water is vital to life, and it can take so many forms, appearing at times black and forbidding, and at others blue and sparkling. It is when you come to view your pictures of it that the magic sometimes disappears.

Photographing water successfully is partly a matter of technique, but it is even more important to think creatively. You must use all the skill you have to capture in a still picture something which is essentially dynamic and liquid.

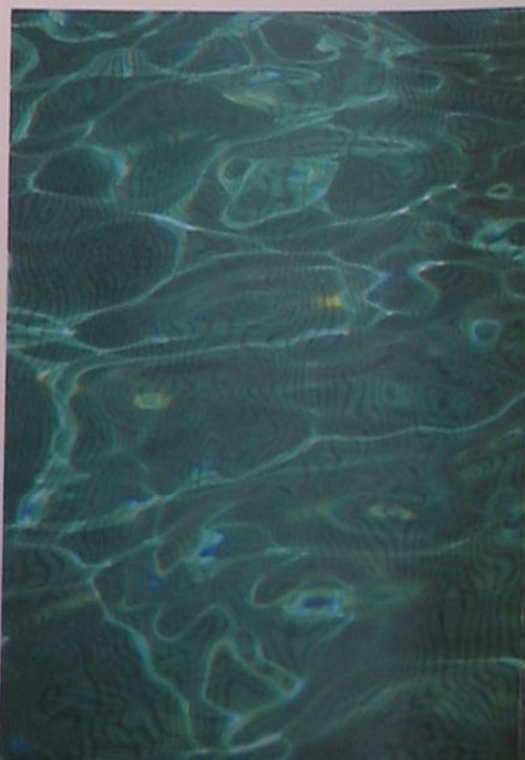
Think, for example, of a waterfall. The beginner will simply click the shutter at some average speed, but the more experienced photographer will make a decision at this point—is it best to 'freeze' the water with a rapid shutter speed, or to allow it to flow for a long exposure? In practice, if you are close

enough for the water droplets to be seen, the best results are obtained at speeds of either 1/250 and faster, or 1/8 and slower. Anything in between tends to look rather like rice pudding. For the longer speeds, a neutral density filter may be needed to cut down the light sufficiently, even at the smallest aperture.

Having made this decision about the appearance of the water, you can now start to think about the rest of the picture. If the surroundings are attractive there seems little problem; but quite often the result is a straightforward pretty picture, with little real originality. It may even be unsatisfactory, because all the ingredients were there but somehow the picture seems lopsided. There is often a problem of balance with waterfall pictures—you have restricted access, and there may be deep shadows which create disturbing black areas. The waterfall, seen from a bank, tends to fill one side of the picture with nothing on

Industrial scene By including such a large expanse of water in the foreground the photographer has avoided concentrating too much upon a mirror image. The evening light produced colour in the still water

Swimming pool The patterns of the sunlight reflected in the water and the way the water distorts the squared tiles on the pool floor produced striking results. Often it is worthwhile showing just water, leaving out all else



the other side to balance it. Alternatively, if you are looking more or less square on to it, it becomes two-dimensional.

To deal with these problems, you should obviously move around as much as possible. Some of the best shots appear with the light behind the water: any dark shadows may then be filled with glinting droplets or spray. A hint of soft focus or flare may not be out of place. Look round for objects in the foreground or background that will either create compositional problems or will fill black holes. It may even be necessary to view the waterfall between fronds of foliage to make it appear to be in a leafy glade—even if it is surrounded by unattractive steps or is largely in shadow.

The bigger waterfalls, up to Niagara size, can be surprisingly difficult to photograph. There is less of a problem with shutter speed, as the water is too distant to show much detail, but people often make the mistake of trying to get everything into the picture, with the result that the waterfall itself is lost between the foreground and the sky. Niagara itself is a case in point. It is a very popular tourist attraction, but access is more or less restricted to viewpoints on either bank. Most pictures of it look rather similar and rather boring.

The amazing thing about Niagara is its sheer size—but this is usually lost in photographs. A good way to show the scale would be to use a long focus lens—probably around 300 mm—to take close-ups of the falls and spray. With such a large image scale, shutter speed again becomes a problem, but with the lens at full aperture you can probably use 1/125 on a fine day even on fairly slow film.

Another way of showing the scale of such a huge waterfall is to include some suitable object near to or in the disturbed water. Small boats often take tourists close to the falls, but are not



Vautier/de Nanxte

Brazilian waterfall Large waterfalls are very difficult to photograph—you have to find a good viewpoint and resist the urge to include the entire scene

permitted to move sufficiently close for you to include them in a long focus shot from the banks. By taking a boat trip yourself, you may be able to take a dramatic shot with another boat in the foreground. A moderately long focal length will compress the distance and make the other boat appear to be virtually underneath the falls. Again you may not be able to choose a fast enough shutter speed, particularly if you are on board a boat yourself, unless you use a fast film.

More isolated waterfalls often present fewer difficulties of access, but you must still strive to show the scale and fill awkward spaces in your composition. Including a figure is an obvious way of showing the scale—you could either take the long focus lens approach, which would mean retreating some distance away, or go to the other extreme and use a wide angle lens from a low viewpoint, with both the figure and the falls towering over you. Both approaches will help to make the falls fill the frame.

Larger falls, where there is plentiful spray around, often have attractive rainbows. You must look for these with the sun behind you—they are seen at an angle of 42° from your shadow, so you will probably need to look down on the spray. A polarizing filter may help to make the rainbow clearer.

Close-ups of falls, whether large or small, also benefit from careful composition. As always, the simpler compositions are usually the more effective so a comparatively long focal length is useful to avoid having to move too close to the water.

The same approach is valuable when you are photographing a stream or small swift-flowing river, with plenty of rocks to impede its progress. Little eddies and splash points can be isolated to capture the feel of movement where an overall shot might be too confusing. Shooting from a very low viewpoint, if you can manage it, may help to compress the

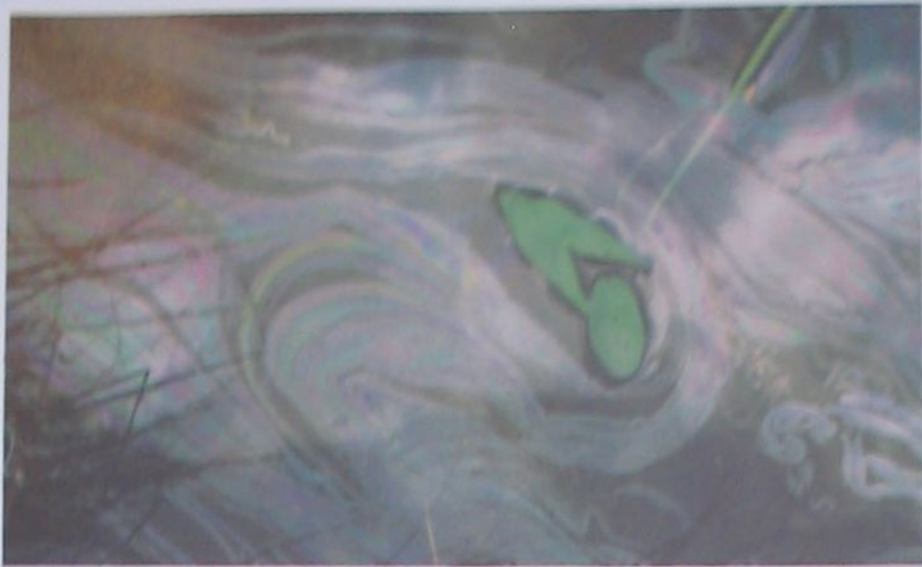
ripples on the water surface to emphasize its flowing nature.

Where the river gets wider, its surface becomes much more bland and uninteresting, and it is often more worthwhile to take the overall view, looking at the shape of the river in the landscape. Running water has a major effect on the landscape, carving and moulding it, so the wide view can be quite revealing.

On a smaller scale, shots taken along the river bank, concentrating on the water, work particularly well if you use reeds or foliage as a frame. Sun glinting on the water is something of a cliché, but you can still find new ways of looking at it by moving in close, using reeds as a frame as if you were some water creature looking to see if the coast is clear. An effects filter, such as a starburst, can be useful; you can often obtain starburst effects without one if you stop your lens down to a small aperture, which is often essential in any case. If you follow the meter's reading, the picture will look rather dark with just a few highlights, so the thing to do is to overexpose by about a stop, or to take the meter reading from an area nearby but without the brilliant glints of light and then lock the exposure on that reading.

Lakes can also prove to be difficult subjects unless you are far enough away from them to photograph an overall view. From the water's edge they appear as large and possibly bland expanses, which turn out to be rather featureless in the final result. Again, natural frames are useful; long focus lenses used looking across the water surface can compress what features there are; and wide angle lenses can turn broad bands of water, hills and sky into semi-abstracts. It may also be worthwhile subduing nearby reflections so that you can see details below the surface in the foreground, such as weed or rocks, to add interest.

Adam Woolfitt/Susan Griggs Agency



Adam Woolfitt / Susan Griggs Agency



Adam Woolfitt / Susan Griggs Agency





Joe McDonald/Earth Scenes/Oxford Scientific Films

Oily river Often there is potential subject matter floating on the surface of water. Here the photographer noticed the way the oily trail curved around the plant and framed the shot to concentrate on this small detail.

Walking in the wet After a fall of rain a city can take on a new look. In this shot the reflections make the vertical lines of the building continue down the full length of the frame creating a striking graphic effect which makes an impressive framework for positioning the people.

Forest dawn A mysterious atmosphere has been established by photographing this scene in the early morning mist, highlighted by the sun. The water in this shot has mirrored the undergrowth, emphasizing the density of the forest.

Wet close-up By closing in on the water droplets clinging to these blades of grass, the photographer has produced an intriguing, almost abstract image. Shots like this usually work best when photographing the subject against the light.

Java salt pan Water always multiplies the effects of dramatic skies—the two together also create a bright background that lends itself to framing a scene with a silhouetted subject. A graduated filter has added colour to the almost monochrome scene of the salt worker. The exposure reading was taken from the brighter areas of the scene to create the silhouette



Richard Haughton



Vautier/de Nanxo



Waterfall The fundamental decision which has to be made when photographing a waterfall is that of shutter speed and whether or not you want to freeze the movement of the water or create a milky blur. Here a slow speed has made the water look like a strange, formless mass, contrasting with the hard shapes of the surrounding rock.

Fountain In contrast, a faster shutter speed has been used for this shot so that the water issuing from the fountain has made trails in mid air. For best effect, a shot like this should be composed so that the trails of water are backlit

Paul Wakefield/Bruce Coleman Ltd.

background of lake or river. Make sure that you expose for the lighter water or sky areas so that you achieve a dark silhouette in the foreground.

Early morning and evening are also times when you may catch mist rising from the water. This may be a positive advantage if you want to create a moody or mysterious picture with delicately muted colours and tones. If the mist is strong enough to obliterate most of the colour, this may be an opportunity to use a graduated colour filter to bring colour to the sky area, so that the water contrasts with it.

Water can take on a remarkably different appearance in different seasons. Rain on the surface of a lake or pond can result in a fractured, moving and glistening surface which can be photographed using different shutter speeds for very interesting effects. Do not overlook the modest puddle at this time. It can provide you with a fascinating series of reflections, particularly at night when splashes of light can be seen in its surface. Try using a slow shutter speed so that colours 'swirl' together.

Perhaps the most extreme change that water undergoes is in winter when it freezes. At this time you can make the most of a monochrome landscape in the background with a frozen lake as the centre of interest, or you can choose to

Reflections themselves, on the other hand, can be one of the main attractions of water for the photographer. The precise mirror images given by calm water are certainly beautiful to the eye, but do not always retain quite their initial attraction. One way round this is simply to photograph the surface of the water so that you avoid the repetition of the double image. Or, if the water is broken up by ripples, go for a more impressionistic effect, with only part of the actual image present in the picture. Some of the most spectacular reflections can be seen when you are looking across water towards a low sun from a fairly high viewpoint. Use a telephoto lens to achieve a really dramatic effect. Occasionally the reflected image is so broken up as to be completely unrecognizable, and you can concentrate on the abstract qualities of pattern and colour instead. As the water ripples depend on the breeze, the shape of the reflection changes a great deal, and you may find, in a comparatively short time, that you have a whole series of different pictures taken from the same patch of water.

The time of day and the type of weather can alter the appearance of any kind of water most dramatically. Late evening, in particular, can transform a dull waterside scene into a romantic or mysterious image simply by the quality of the light. A dull, muddy river might become a bright ribbon of gold while a tiny pool can be turned into a patch of light bringing relief to dark, rolling hills and a menacing sky. The colours of the sky may be richly saturated, re-



Richard Haughton

flecting into the water, and cloud formations may be lit from below, giving vivid reflections.

Evening light can pick up every detail and ripple in the water, and it may be worth exploiting these effects with the help of a telephoto lens. Use any foreground details in the late afternoon and evening, especially silhouettes which can provide a positive contrast to a

exploit colour contrast, using brightly dressed children skating on the ice as a contrast to the white surface of the water. Whether it is spring or autumn, do not overlook colourful blossom or dead leaves which may have fallen into the water from adjacent bushes and trees. When photographed at close range, these provide bright contrasts with the tones of the water on the bed below.

What went wrong?

Photographing friends

Homer Sykes offers his criticism of three appealing pictures of people's friends, and explains why there is room for improvement in each case



There are four main reasons why this photograph does not work as well as it might. The first is simple—it is slightly overexposed. The second 'mistake' is the fence. This is rather ugly, as the strong diagonal bars dominate. I would have moved the subject away from the fence and used a tree as a prop, perhaps leaning the girl up against it. There is a rather unfortunate branch apparently growing out of the girl's head, which could easily have been avoided. Lastly, the photographer has not decided whether he wants a full length or three-quarter length portrait.



The photographer has used imagination and decided on a rather low angle to photograph this man in his Arran jumper. This has led to one main problem—there is an uncomfortable amount of distortion. The man appears to have a very large arm which dominates the shot. Perhaps the photographer should have crouched just a little bit lower and included the top of the trousers in the picture. This would have broken dominance of the Arran jumper and told us more about the subject. The framing could also be improved by moving lower, to include all the man's hand and elbow and remove the telegraph lines.



This rather charming photograph of the child and dog could have been improved in several ways. The most obvious would have been for the photographer to have moved a couple of paces back and therefore included all of the dog's hind and fore legs. When learning to take photographs we are all told about the golden rule of getting in close and not being afraid of the subject. That is all quite true. But in this case it was unnecessary.

If it had been possible to gain a little extra height, the child and the dog would have been seen against a plainer yellow-brown background which would therefore not have been so distracting. At the moment the child's head is lost in the band of green trees running across the top of the photograph, which though not unpleasant is not ideal.

On the other hand, a slightly lower angle, looking up slightly, would have put the child against a plain blue background which would have been pleasing. By choosing this lower angle more of the wall could have been added—its texture would have been interesting and this element would have added greatly to the composition. As it is, the picture tends to lack that essential spark which turns an attractive shot into a clearly recognizable prizewinner.



52 TALK

Streets apart

Comparing an old print of an area with the way it looks now can make an interesting assignment and, as Homer Sykes shows, prompts a range of ideas



90 years ago This is one of the prints that inspired Homer to document the area's modern face

Facelift The buildings are the same but the facades have changed. A 35 mm lens framed this symmetrical view

Nearly a hundred years ago, before tall buildings punctuated the London skyline, before there were tedious, smoggy traffic jams, photographers were already making a record of their surroundings. As they lugged their huge wooden plate cameras and tripods across the cobbled streets, perhaps they wondered if future generations would ever see their faded prints and marvel at the way things used to be.

Indeed, many people are interested in looking at images of the past and gaining insight into the way our city streets have changed. This is what inspired Homer Sykes to photograph a small area of Battersea, London, which he had seen depicted in a series of old prints at his local library. Using these prints as a starting point, Homer set off to document the way the area has changed and to shoot a set of photographs that conveyed his own personal impressions of the area.

He was surprised to find that many streets were still recognizable and he framed his own shots to include some of the same buildings. In many cases, the only thing that had changed was the facade—a local ironmonger now a wine bar—the structures were largely original. Yet there were also immense changes—whole neighbourhoods cleared away to make room for monolithic housing complexes.

For this assignment Homer felt it was



Homer Sykes



Behind the wheel This is a common enough viewpoint but not one which many people would think to take. The golden light of evening enhanced the scene. 28 mm lens, 1/500 second at f/11. All shots were on Kodachrome 64

Coloured shopfront Homer noticed the colourful window but decided to wait until a figure came into view. He pressed the shutter at just the right time to capture a graphic moment in the man's walk. 28 mm lens

Power station The familiar shape of this building dominates the skyline of south west London. Homer framed his shot so the white chimneys loomed over the black roof. Once again, he wanted a figure in view

important to try and cover the area from several different viewpoints—especially the ones which people come across everyday. So often photographers fail to notice potential subjects in their own territory because of its familiarity—they walk along a pavement or drive past in their cars and miss the very things which sum up an area. But Homer deliberately exploited these common viewpoints to create interesting photographs—even to the extent of using his camera while behind the wheel of his car.

Homer's general approach was to walk around the area at random looking out for potential subjects. When he found a detail or a facade, he chose not to photograph it straight away but to wait until an interesting figure walked into the frame. This added human interest and produced a more involved and complete statement about the area.

Homer Sykes





Tower blocks *These large buildings are featured and framed to overshadow the woman*

Young couple *Two youngsters looking for jobs? Homer felt this shot showed another modern change*

555 *The red door and street number caught Homer's eye, but the human element completes the scene*



Remote control equipment

For some shots, there is no way you can remain behind the camera to press the shutter. On such occasions remote control equipment is invaluable



There are many types of shots that cannot be taken by merely pressing the shutter release button on your camera. For these occasions, you must use some kind of remote control device. Some are available as stock items but others must be improvised.

At the simplest level, a remote control device, such as a cable release, helps to avoid camera shake when giving exposures longer than 1/60 second using a tripod. The problem becomes more complicated, however, if you need to be away from the camera, holding or manipulating equipment while the picture is taken, or if you wish to take candid shots or photograph shy wildlife at close range. In this case, various long distance triggering systems are needed.

Conventional releases are either cable, electric or pneumatically operated

Cable releases

Perhaps the simplest and least expensive remote control device is the conventional cable release. These are available in a wide range of finishes—including fabric and clear plastic—and vary in length from about 250 mm to more than a metre. The shorter ones—costing little more than the price of a 20 exposure print film—are intended purely for long exposures when the photographer is close to the camera. If you buy one of these, make sure it flexes easily so that there is no chance of vibration from your hand being transmitted through the release to the camera. Some releases,

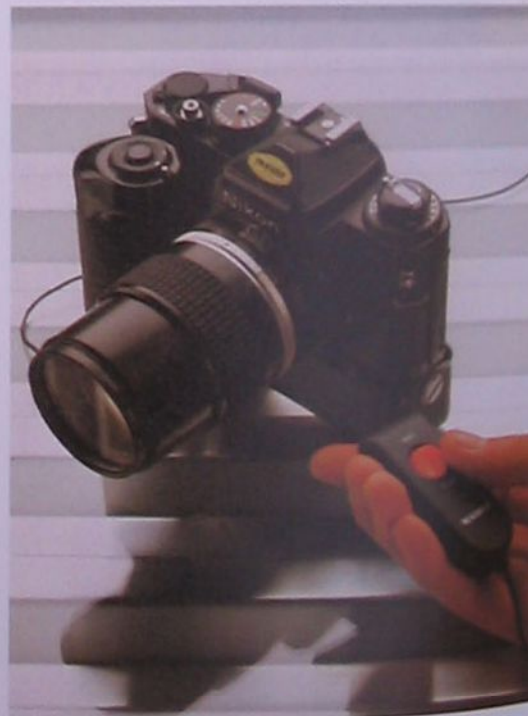
with metal-wound outer sheaths are durable but are in fact, quite inflexible.

You might also wish to make extra-long exposures, so a shutter release that is lockable is the best choice. A good design enables you to set the shutter release so that it stays depressed simply by pressing a lever. To close the shutter after a long exposure, the lock button is pressed. This has the advantage of being operable by one hand and so avoids the risk of shaking the camera which can occur with a screw-type lock.

Pneumatic releases

A pneumatic shutter release combines the advantages of smooth action, long reach and easy operation. The device can extend more than 5 m and does not cost much more than a cable release. The release mechanism at the camera end consists of an air-driven diaphragm, operated by squeezing a rubber bulb at the end of a thin connecting hose.

A pneumatic release can be operated by squeezing the bulb either by hand or



Electric release This is merely a length of twin-core flex and a simple switch, used to extend the triggering circuit of a motor drive or auto winder



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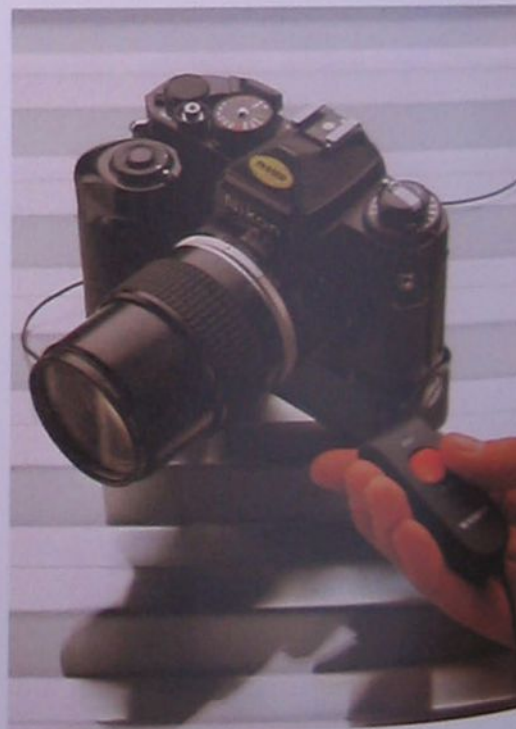
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underfoot while it is on the ground. Most do not have a locking device but the shutter can be kept open if a weight is placed on the bulb.

If used carefully, a pneumatic release should be no trouble. A common problem is that the bulb does not recover its shape when you let go, so the shutter will not close if the camera is on the B setting. This happens if the bulb is pressed too vigorously, causing air to escape from the system. The best remedy is to detach and reconnect the hose at one end, and apply only gentle pressure when you use the device. Greater sophistication and longer range can be achieved either by buying a suitable stock unit or by improvising.

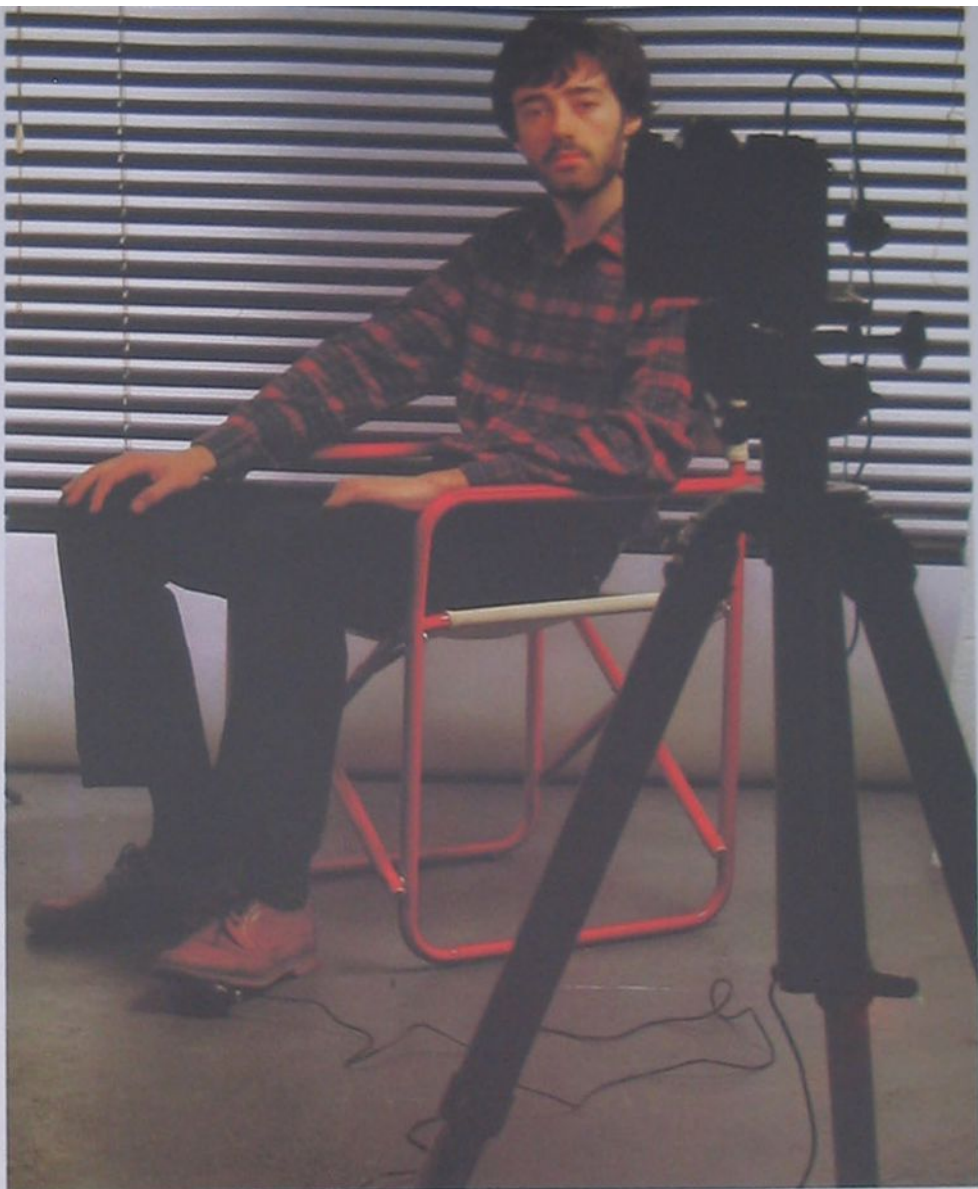
Electrical triggering

Mechanical triggering methods using cable and pneumatic releases are cheap but restrictive. Much more flexibility is offered by electrical triggering methods. These range from very simple to quite advanced, and in some cases the equipment is not available off the shelf and you must make it yourself.

There are two main ways of taking a picture by electrical triggering. The first can be carried out using virtually any camera, and involves triggering a flash only, to provide all the illumination. This can only be done at night or in a

A pneumatic release is particularly suitable for taking self portraits or operating the camera while you are manipulating equipment in the scene. An electromagnetic plunger (below) gives you just as much freedom away from the camera, but it is more elaborate and expensive

Roger Payling/equipment courtesy of Bush & Meissner Ltd.



An ultrasonic trigger has no connection between the camera-mounted and hand-held units, but its range is limited to the size of a large room



A sound-operated trigger employs transistorized switching to achieve rapid response—it is used here to 'freeze' the cork being ejected from a pressurized bottle.

dark room, but is useful for photographing wildlife (see page 1673). The other method, which is much more versatile, requires the use of a camera which has a motor drive.

In both cases, all that is needed to trigger off the exposure is to touch two electrical contacts together. Any flash unit can be operated by touching together the contacts of the inner and outer parts of a flash lead. This usually involves adapting an ordinary flash lead by cutting it and taping the wires. A motor drive unit usually has two contacts which will operate the shutter when they are touched together. The current and voltage within the circuit are low, so there is little danger involved, but losses in the cables could be considerable if the wires are particularly long—more than, say, 50 or 100 metres.

Sound-operated trigger

Sound-operated remote triggers are not widely available but they are simple in principle and inexpensive. One design, made by the German firm Inno Drust, measures 30 x 60 x 115 mm and sells for about as much as three rolls of Kodachrome. Essentially, the unit consists of a miniature microphone, which detects ordinary sound frequencies. The electrical signal from the microphone is amplified by a transistorized unit which closes a circuit. The device can then be connected by means of an external cable to either a flash or a motor drive unit.

The sound-operated trigger is particularly effective in enclosed spaces because it works equally well by direct or reflected sound. At a distance of about 3 m, the sound of a spoon falling on an egg can trigger a shutter set to 1/500,

for example, to 'freeze' the falling spoon on the broken egg. But sensitivity falls off rapidly at greater distances, where louder sounds are required to trigger the device.

Infrared triggers

Another form of remote control uses infrared radiation, whose wavelength is close to the red end of the visible spectrum. This gives a beam that is deep red in colour but of an intensity which is too low to affect the film. The standard infrared triggers are two-unit devices, with a hand-held, pocket-sized transmitter, and a receiver mounted on the hot shoe or a bracket on the camera. Each unit is powered by its own separate battery, and incorporates an on/off switch and test facility. The only connecting lead is from the receiver to the camera motor drive unit. If you buy an infrared trigger, make sure the connector fits your make of camera, or you will need an adaptor.

Some systems have up to three channels, so a single transmitter can be used to trigger more than one receiver. And a facility common to all is single frame or continuous operation—achieved by a two-way switch on the receiver. To use the system, each unit is switched on and channel 1 is selected on both. If single frame operation is selected, and the trigger button pressed, the receiver will pick up a single pulse of infrared signal and expose just one frame. In the other, the two units need not be aligned because the receiver responds equally well to both direct and bounced signals. In the open, the signal can be bounced off objects—such as buildings and rocks—to a limited extent, but line-of-sight control is possible up to 60 m.



By selecting 'C' (for continuous) on the receiver, and pressing the trigger, a series of pulses is transmitted, each exposing one frame. In this mode, you can make time exposures (using the 'B' setting on the camera). The first trigger pulse releases the shutter, which stays open until it is closed by the second.

Some units are made as part of a camera system, such as Nikon's Module ML-1 and the Canon LC-1. The Nikon model has two channels, and the Canon has three. Other units, however, fit a more limited range of cameras, such as the three-channel Minolta IF-1, which is designed to fit the X-700 camera, motor drive and data back system.

It is also possible to buy units made by independent manufacturers. The Kallack Beacon 200, with three channels, is one example. Connectors are available to suit a wide range of motor drives and there is also a conventional flash socket.

Despite the sophistication and expense of infrared systems, they must be triggered manually. This is a disadvantage if your subject is unpredictable. For example, you might know the route taken by an animal or bird but could easily miss its appearance. This problem is best solved by adapting a security system, which raises an alarm when a beam is broken. One system sends out a pulsed infrared beam to a reflector (up to 50 m away) which throws it back. An alarm sounds when the beam is interrupted. Alternatively, it can be set to sound continuously once the beam has been broken, only while the beam is broken, or for an extra ten seconds after a break. The signal that powers the alarm can be used, indirectly, to trigger a motor drive unit, and the choice of

alarm modes gives a wide range of shutter operations.

A simple adaptation is to replace the alarm (usually sold separately anyway) by a miniature relay operating off the same voltage as the alarm, commonly 12V. The relay is a switch operated by a solenoid so that when current is applied, the switch closes.

When the beam is interrupted, the unit allows current to flow to the siren or, in this case, the relay or solenoid. This then closes the circuit to which you have attached either your flash leads or the lead to your motor drive.

If you are carrying out the work yourself, check with the camera manufacturer which terminals operate the motor drive. Remember that the system only needs to complete the circuit, and that you do not need an external power supply to the motor drive or flash unit, —this could damage it.

Radio control

The most advanced remote control equipment uses radio waves to operate the triggering device. Such equipment is not only expensive but must be licensed in many countries, including the UK, where controls on broadcasting are strict. But it is possible to adapt the systems used for radio-controlled models to operate a motor drive or flash. In the UK and some other countries, radio equipment is licensed to operate models only, so strictly speaking, its use for operating a camera is prohibited. But the rules vary from country to country so check with your licensing authority.

Radio control equipment consists of a hand-held transmitter and a receiver mounted on the model. Commands to the model—such as turn right—reach the receiver as coded radio signals, which are converted into mechanical movements by servo motors. The motors then operate linkages that carry out the commands. The linkages are arranged to move a throttle lever, shift a rudder or even depress a shutter release.

The problem, therefore, is to attach the receiver on or near the camera and mount a servo motor and linkages on the camera, without obscuring the lens or photo cells. Some experiments will be necessary to find the most convenient method of attachment. One technique is to bind the servo motor on with wire, twine or tape. Alternatively, you could clamp a rigid support on to the tripod and arrange for it to curve or angle towards the shutter release button. Whatever solution you find, care will be necessary with alignment and rigidity, but the problem should be well within the scope of a competent modeller.

Operating the shutter release button by mechanical linkages is probably the only means of remote control for many cameras. But if your camera has a motor-drive attachment, your choice of remote control is much wider. All that is required is a switch to close the circuit on the motor drive.

Light-operated switch

For the do-it-yourself electronics enthusiast, a light-operated switch to trigger a motor drive can be a most satisfying project. This can be constructed from a few readily available, inexpensive components using diagrams commonly found in most hobby electronics books.

The circuit for a typical light-sensitive switch is based on a *photoresistor*—a semiconductor device whose resistance varies with the amount of light falling on its surface. The change in resistance causes the circuit to activate a relay, which can be connected in the circuit of the motor drive unit via a jack plug. Either the relay connection or the photoresistor can be connected by a long conductor. The circuit can be made to switch either when the photoresistor is covered from daylight or when it is uncovered and exposed to daylight. And the sensitivity can be adjusted to compensate for ageing of components or for different ranges of light and dark.

Roger Payling/trigger courtesy of Photax

Infrared triggers are now commonly available. Contax were among the first manufacturers to build these devices; a current model has two channels

Ultrasonic triggers

Sound at ultra-high frequencies can also be used for remote control. In principle, a transmitter similar to the ultrasonic device used to control TV receivers remotely is used to generate a signal, by pressing a metal trigger. This is no more than a metal strip that scrapes against a metal stud, all enclosed in a matchbox-sized case. In fact, shaking a bunch of keys will even transmit a suitable ultrasonic signal. In the camera's accessory shoe is mounted a receiver for the ultrasound. This converts the sound energy into an electrical signal, which energises an electromagnetic plunger, which in turn actuates a shutter release cable. The system is effective over a range of about 5 m and is more sensitive indoors due to reflection.

Improvised trigger A typical announcer/alarm system transmits infrared beam pulses, which are reflected back. If the beam is interrupted, a 12 volt output triggers a motor drive by means of a relay (inset)



Improve your technique

Pinhole pictures

The pinhole camera is the simplest of all optical systems, and is easy to make. It is more than just a novelty, too—it can be used to take pictures which would otherwise need expensive lenses

Today many people think that you need a mass of technology in order to take good pictures. But in fact it is possible to take photographs using nothing more than a box with a tiny hole at one end and film at the other—a pinhole camera.

Indeed, pinhole cameras can be surprisingly versatile. You can use them to make a wide angle, long focus, zoom, multiple image, panoramic or even giant format pictures.

Pinholes produce soft, uniformly unsharp pictures with a quality all their own. Panoramic pinhole pictures are possible with a little DIY handicraft work, and you can even produce multi-image effects by piercing several closely spaced holes. 'Telephoto' pinholes are made simply by placing the hole a long way from the film. A zoom is created by fitting the pinhole to a bellows unit to vary the pinhole-to-film distance.

The camera body

Although the traditional pinhole camera is a simple home-made box, it is actually far easier to use an ordinary camera body for straightforward pinhole shots. Simply remove the lens and replace it with a home-made pinhole and expose in the normal way. This gives you a guaranteed light tight body and enables you to load the camera without retreating to the darkroom. A normal camera body is also far easier to work with.

The disadvantage of a camera body is that you cannot take ultrawide shots. The problem lies with the thickness of its body (about 40 mm). With the pinhole in position flat over the camera's lens throat, it will give an angle of view similar to that of a 40 mm lens. Only by placing the pinhole closer to the film can a really wide angle effect be produced. But unless your camera has a mirror lock you cannot do this.

A 35 mm rangefinder camera has a thinner body and no mirror. With its lens removed, a pinhole in a sunken mount can be pushed inside the throat to within a few millimetres of the shutter blinds, though if it is very close, the throat will restrict the field of view.

Both the SLR and the rangefinder bodies have built-in focal plane shutters. This makes exposing the film convenient and fully controllable. However, exposure times with pinholes are often very long—several seconds is common—so a shutter is far from essential. Other less sophisticated camera bodies without shutters can be used very successfully. Old, broken folding camera are par-



Daffodils Pinhole optics, used here on 35 mm Agfachrome, have infinitely wide depth of field—or, alternatively, the definition is equally bad at all distances. The pinhole was 14 mm from the film for this shot

ticularly good. With the lens, bellows and folding mechanism removed you are left with a very thin body and the freedom to place the pinhole as close to the film as you wish. But before starting such a drastic 'modification' make sure that the camera is expendable and that it takes a currently available film size. The 120 size offers the widest choice of emulsion types in roll film.

Other cameras worth considering for similar treatment include peel-apart Polaroid and 126 cartridge-load types. The 126 cartridge can even be used on its own providing a light-proof panel or box is fitted to the front.

All sorts of boxes and tins can be used to form the basic body. A round biscuit tin cut in half across the diameter makes an ideal basis for a panoramic camera. All you have to add is a front panel with a pinhole in the middle. For really huge pictures try a plastic dustbin!

Great precision is never required in any of these constructions—stiff card and hardboard are suitable materials. To make the camera lightproof, tape over all joints with at least two thicknesses of black insulating or carpet tape and paint all interior surfaces matt black. Cement a $\frac{1}{4}$ inch Whitworth nut to the base of your 'biscuit tin' camera, this allows you to fix the camera to a tripod.

Home-made cameras have to be loaded in a darkroom or changing bag. If you want the freedom to take several pictures on location, make sure that you have a changing bag large enough to accommodate the camera and two light-proof containers—one for exposed and one for unexposed materials.

Choosing the film

The best type of film to use for home-made pinhole cameras is sheet film, as this is easiest to handle. It is available

in sizes from 5 x 4 inches (12.7 x 10.2 cm) to 40 x 30 inches (101.6 x 76.2 cm). Unfortunately, sheet film is very expensive. For panoramic pictures you can use roll film, detaching it from its paper backing, and taping the actual film in place around the curved inside of your camera. You can also use short lengths of 35 mm film.

For giant shots, you can use paper instead of film. Exposing on to black and white printing paper produces a negative image—this must be contact printed to give a normal positive print (see pages 1149 to 1151). Ordinary black and white printing paper can be used for the exposure, but it will distort some tonal values since it is only sensitive to ultra-violet and blue light. Panalure II RC paper is a panchromatic black and white paper designed for colour negatives and this gives better results, in particular recording red, green and orange colours at about their correct tonal values. The print may be made on conventional paper since the negative has the correct tones.

For giant colour pictures, try Cibachrome or Ektachrome R14 paper. These materials are balanced to give accurate colour in tungsten illumination, so if you use them in daylight you must fit an 85B filter. Other filters may be required to give completely accurate colour and you should experiment to achieve the right results. Both Cibachrome and Ektachrome papers give a direct positive image so no further print stage is needed. However, you must remember that an image formed in this way is laterally reversed—like looking into a mirror.

Exposure and filtration are best determined by a practical test. Take exposure meter readings at the same time and record all data. Once you have achieved a good result you can relate meter reading to actual exposure given for future reference. Printing paper should be processed promptly.

Making the pinhole

Once you have decided on the size of camera and the angle of view, you can set about making the actual pinhole.

For every pinhole-to-film distance (the equivalent of focal length in a lens) there is an optimum size for the hole. Make the pinhole larger than this size and the image becomes brighter, but less sharp. Make the hole smaller than the optimum and sharpness still deteriorates due to diffraction and the image gets darker. Details of the calculations involved and a list of optimum sizes is given in the 'Optimum pinhole size' box.

The hole should be perfectly circular and made in very thin material. The edges of the hole must be free from all fibres or fragments. Black card can be used, pierced with a hot needle to burn off any fine fibres at the edge of the hole. But metal foil is a better material to work with.

You need, in addition to the foil, scissors, centrepunch, a small hammer,



1 A round biscuit tin can be turned into a good panoramic pinhole camera. Begin by cutting the tin in two using tinsnips, as shown here



2 The inside of the tin, including half the lid, should be painted matt black. This paint is sometimes called 'camera black' or blackboard paint



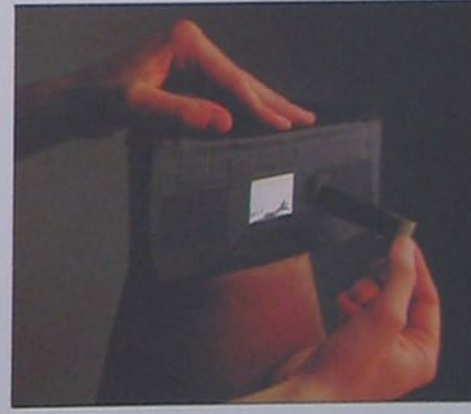
3 Make the front of the camera from stout black card. It can be stuck on using black carpet tape, which also forms the hinge for the lid



4 The pinhole must be made in a very thin material. Baking foil is often used, as it can be taped to the centre of the card camera front



5 In the dark, tape a sheet of photographic paper (emulsion outwards) to the curved inside of the camera. Tape the lid on securely



6 The shutter is simply a piece of black tape, stuck back to back at the centre to prevent it from damaging the pinhole. Use a secure base

a whetstone, a fine needle, and a flat piece of wood or metal with a hole about 6 mm across in it.

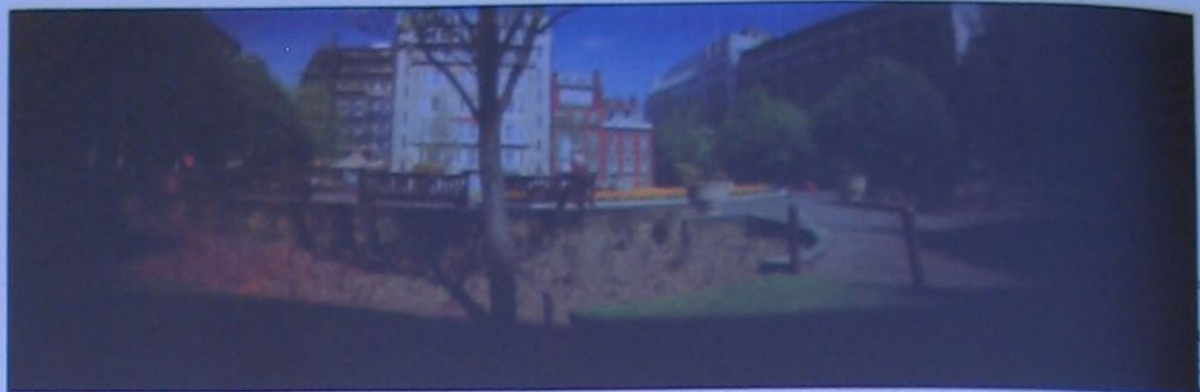
Cut a piece of foil about 20 mm square. Place it over the hole in the wood and tap it gently with the centrepunch. Use only enough pressure to make a shallow dent in the middle. Gently rub the 'bump' side of the foil in the whetstone to reduce its thickness. Push the extreme point of the needle into the centre of the

dented surface to make a minute hole. Turn the foil over and push the needle in from the other side, rotating it slowly. Keep the needle upright and use minimum pressure.

You now have to measure the diameter of the hole to establish the taking aperture. This is best done with the aid of an enlarger. Tape the foil to a slide mount and place it in the enlarger. Focus the image of the hole using the

Panoramic pinhole

This was taken using the camera shown under construction on the previous page. The material used was Ektachrome R14 reversal paper which required an 85B filter to balance it to daylight. A 15 second exposure was needed



maximum degree of enlargement possible. Check the shape of the hole and measure the diameter of its image. Remove the foil and replace it with a clear plastic rule, or piece of film marked with a centimetre scale. Using a second rule on the baseboard, measure the size of the projected scale—this gives you the degree of enlargement directly. Divide the diameter of the pinhole image by the degree of enlargement and you have the actual size of the pinhole.

Compare this figure with a scale for optimum pinhole sizes (see panel). Providing your pinhole is within 15 per cent of this figure, it is of the right diameter.

Having chosen a 'focal length', made a pinhole and measured its diameter, you can now work out its *f*-number. Simply divide pinhole-to-film distance by the diameter of the hole. For example, if your 'focal length' is 30 mm and the pinhole's diameter is 0.24 mm then the *f*-number is 30 divided by 0.24 which equals *f*/125.

Once you have made a satisfactory pinhole, glue or tape the foil in place. A sheet of stiff black card with a central hole makes an adequate panel. Cut to the appropriate size and shape, this can be fitted directly to the front of the camera body and lightproofed with

black tape. Paint the rear of the foil matt black, but take care not to fill part of the pinhole with paint.

Viewfinder

You do not need to focus a pinhole—every part of the subject is recorded equally unsharply. But although some of the pleasure of working with pinhole cameras comes from the unpredictability of the results, you may want some form of viewfinder to help compose the picture. With an SLR body used in bright daylight (with mirror down) it is just about possible to see an image on the screen. All other types of pinhole camera need an accessory finder.

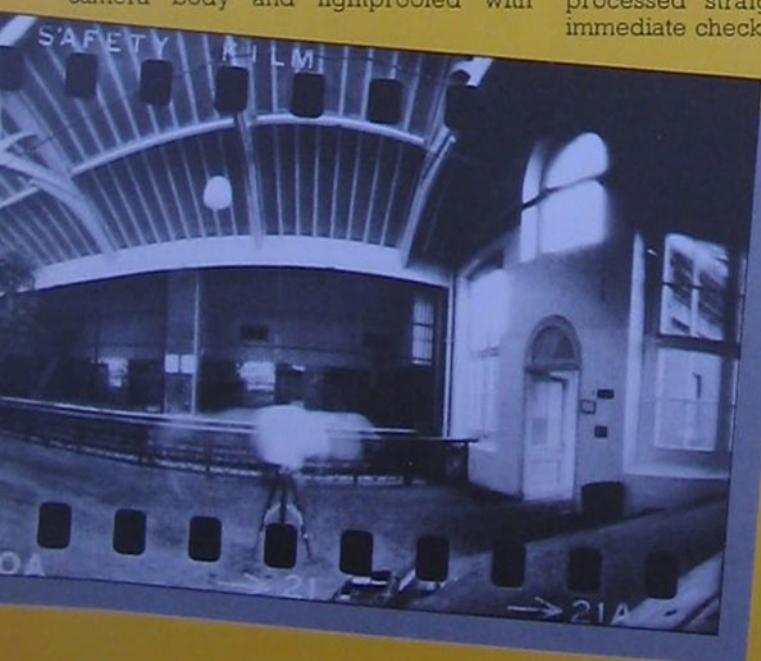
An optical viewfinder like those sold for rangefinder cameras can be used. Even if it does not show the exact field of view it helps in aligning the camera with the centre of the subject area.

A more accurate viewfinder is easily made by constructing an open frame the same size as your film format. This frame is then viewed via a central 'peephole', positioned behind it at a distance equal to the pinhole-to-film 'focal length'.

To align the viewfinder on the camera body, shoot a test film with the camera firmly fixed in place. It is best to use black and white film because this can be processed straight away to allow an immediate check.

Sprocket shot

If you use 35 mm film the image will overlap the sprockets and edge markings. Rather than crop these out during printing, you can include the full area to produce an unusual and interesting image. This picture is of an interior and, without a pinhole camera, would have required a fisheye lens for the same coverage



Derek Drage

Exposure techniques

If you are using a camera body, you can use the camera's shutter; if you are using a home-made camera, you can make the exposure simply by removing a cover from the pinhole and replacing it after the specified time—a lens cap makes an ideal 'shutter' cover.

When shooting on ordinary black and white film, exposure can be determined with a hand-held meter. However, it is quite possible that the scale on your meter does not include the effective aperture of the pinhole. To overcome this problem, you can use the following technique.

Take a meter reading in the normal way. Note the exposure time at *f*/16, then calculate the reduction in exposure time by counting how many stops smaller your pinhole is than *f*/16. The full sequence of *f*-numbers up to *f*/512 is: 16, 22, 32, 45, 64, 90, 128, 180, 256, 360.

If your pinhole has an aperture of *f*/128, for example, then the exposure time must be increased by a factor of six in comparison to the exposure time of *f*/16—*f*/128 is six stops smaller than *f*/16. Since each stop is a change in exposure of $\times 2$, six stops is $2 \times 2 \times 2 \times 2 \times 2 \times 2$ —that is, 64-times greater exposure.

So the exposure time at *f*/128 is $1/15 \text{ second} \times 64$ —four seconds. Unfortunately, this exposure time may still not be correct. Most emulsions suffer from a loss of film speed at such long exposure times due to reciprocity law failure. So a further correction factor must be applied. This varies according to the length of exposure time and the characteristics of the film in use.

As a rough guide, for exposure times between one and ten seconds, apply the following factors—Ilford black and white $\times 2.5$; Kodak black and white $\times 3.5$; Kodak colour $\times 2$.

With colour slide film you may also find there is an overall colour cast. Once a cast has been found, and clearly identified as being due to the long exposure, then it can be corrected in future photographs by filtration, though this requires even more exposure.

Slow tungsten balanced colour film is designed for long exposures and so hardly suffers from any loss of film speed at times of around ten seconds.

Derek Drage

Optimum pinhole size

Optimum diameter for a pinhole depends on both the pinhole-to-film distance and the wavelength of light being used. Since photography is normally carried out in daylight, an average value is chosen.

Pinhole size is calculated as below:

$$D = 3.6 \times v \times W$$

Where: D = diameter of pinhole

v = pinhole-to-film distance

W = wavelength of light

The following table gives a list of likely pinhole-to-film distances (v), their optimum diameter (D) calculated from the formula, the f-number, N, of that combination and the factor by which an exposure time of 1/16 must be multiplied.

v (mm)	D (mm)	N	Exposure factor
10	0.14	70	20
20	0.20	100	40
30	0.24	125	60
40	0.28	140	80
50	0.31	160	100
60	0.34	180	125
70	0.37	190	140
80	0.40	200	160
90	0.42	214	180
100	0.45	220	190
150	0.54	280	300
200	0.63	318	400
250	0.70	360	500
300	0.78	390	560
350	0.84	418	700
400	0.89	450	800

Remember, though, that shooting in daylight with a film such as Agfachrome 50L or Ektachrome 50 Professional, you need to use an 85B filter. The extra exposure needed can be taken into account by adjusting the film speed dial on the exposure meter by the appropriate filter factor.

You may be tempted to avoid the loss of effective film speed on long exposures by starting out with a high speed emulsion such as Kodacolor 400 or Tri-X. In bright daylight, even with an aperture as small as f/128, your exposure time could be as short as 1/2 second. This is a useful approach to take, but only if your camera has a shutter.

If you are using an improvised body without a shutter then such short exposures are impossible to time accurately. Here you should use a slow or medium speed film, possibly in conjunction with a neutral density filter, to give an exposure of four seconds or more.

When using a camera without a shutter, fix any filter required in place before you load the camera. Once loaded the lens cap shutter cannot be

raised without exposing the film. If you need to change filters this has to be done inside a changing bag or darkroom.

With an ultra-wide angle pinhole image, the centre is much brighter than the edges or corners. Fortunately the effect is rather attractive, creating a strong bright centre of interest, while the dark edges help to 'hold in' the composition.

However, if you want to minimize the effect, give extra exposure when using negative film by at least doubling the estimated time. At the printing stage you can even up the density difference between centre and edge by 'burning in' the middle. With slide film a compromise exposure has to be found. In this case it is best to expose for the bright parts to avoid washed out highlights. Cameras with curved backs, used for panoramic pictures, do not have this problem as the pinhole to film distance is constant across the film.

Taking into account all the various problems and effects possible with a pinhole image, negative film offers the best all round performance especially

for colour photography. Exposure latitude is greater than with slide film, but the main advantage is that density and colour quality can be finely adjusted at the print stage.

Because it always requires a long exposure time the pinhole camera is best suited to fairly static subjects. Landscapes are the obvious choice, though in bright light you can easily shoot portraits providing the subject remains moderately still. The pinhole picture is never crisply sharp so any slight blurring is masked by the overall softness.

It is worth exploiting the long exposure to produce pictures which use blur and image movement creatively. To take a simple example, moving tree branches and rippling reflections on water will both record as indistinct images. With the right choice of subject both effects can lend an air of mystery or strangeness to an otherwise mundane scene. And with a pinhole camera, these effects are achieved simply and cheaply.



Derek Drage



Multiple images
Effects that would normally require special filters are easy to produce with a pinhole camera. The picture above was taken in a single exposure using eight pinholes instead of just one. The separation of each image on the negative is the same as the separation between the pinholes.

Abbey ceiling
Almost any type of container can be used to make a pinhole camera. Distortions were created here by placing the pinhole in the curved surface of a cylinder

Understanding...

Colour masks

Every photographer who uses colour print film regularly is familiar with the characteristic orange colour of the negatives—but just why are they this colour?

While the use of subtractive dyes to form the image helps to make modern colour film remarkably versatile and easy to use, it also leads to the inaccurate rendition of a few specific colours, notably mauve and turquoise. Fortunately, deficiencies can be reduced and colour rendition improved, by the use of special masks.

With colour negative film,

the dye deficiencies would be more severe because the unsatisfactory dyes are used twice—once in the film and then in the print. So every modern negative film incorporates these masks in the emulsion at manufacture, so they are referred to as *integral masks*. It is the integral masks that give colour negatives their very distinctive amber colour.

Colour slide film does not need masking as much as colour negative film, because the dyes are used only once, and the amber mask would be unacceptable because slides are viewed directly. However, when accurate colour is essential—such as for reproduction purposes—dye deficiency masks may be used at a later stage if necessary.

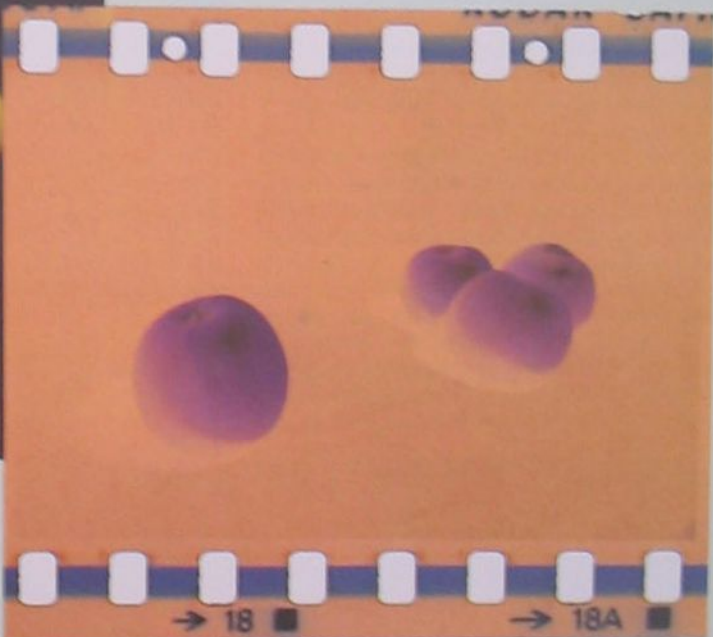
Integral negative masks

The reason that mauves and turquoises are reproduced badly is that the cyan dye absorbs too much green and blue and the magenta dye absorbs blue (see page 1970). The idea of the masks is to neutralize this unwanted absorption.

Although it can sound a little involved, the integral masks actually work very simply. Basically, they work by filling in clear areas in the magenta and cyan layers with appropriate coloured filters so that the unwanted absorption affects all the picture equally. It therefore affects no colour in particular and, although a little light is lost in the process, the result is to



Green apples In the negative, the apples are recorded in magenta and cyan (giving purple). Only areas where these dyes do not appear need masking, so pink and yellow masks are absent



Red letter box Look at the cyan image of the red letter box—it has a trace of yellow from the magenta layer mask, because the magenta dye has not been formed in this area





Sunshade For reproduction, masks can be made to correct over-dark blues in slides

and a pink mask in the cyan layer. It is the combination of the yellow mask and the pink mask that gives negatives their distinctive amber colour.

If you look closely at a suitable colour negative, you may notice that the amber cast is absent in areas of pure magenta dye and pure cyan dye. This is because these areas do not need masking—they already carry the unwanted absorption.

The masks are formed by using the colour couplers incorporated in the emulsion to form the image dyes. In colour slide film, the colour couplers are colourless; in colour negative film, they are dyed the colour needed to make the mask. The colour couplers in the magenta layer are therefore yellow; those in the cyan layer are pink. When the film is processed, the colour couplers form magenta and cyan dyes in the appropriate areas and disappear: in areas where the magenta and cyan dyes are not formed they remain to give the masks.

Slide masks

Because the eye cannot adapt to the overall pink mask of the colour negative, slide film cannot be given an integral mask. However, when separation negatives are made for reproduction in print, special silver masks can be used to give the same degree of correction. Essentially, they work in the same way as the integral masks but use a combination of negatives and positives.

When the separation negatives are made on black and white film, the green negative records all the magenta dye areas in the slide original and the red negative records all the cyan areas. If positives are made from both the red and the green separation negatives, the result is a silver 'mask' for both the clear areas of the magenta layer and the clear areas of the cyan layer. If these positives are made of a suitable strength, they can be used in combination with the green and blue separation negatives to balance out the unwanted absorption of these colours. In this way, the worst dye deficiencies can be effectively corrected.

neutralize the bias.

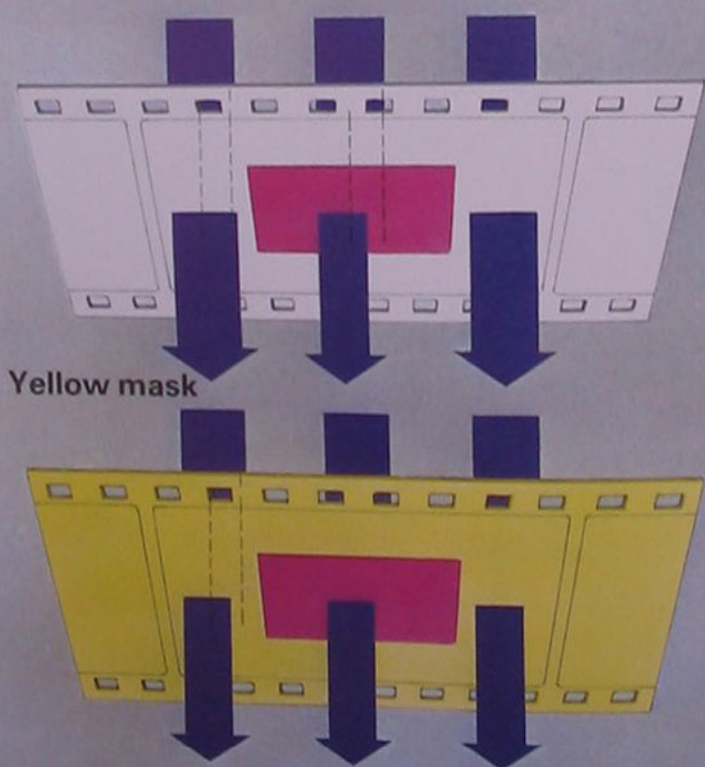
In the magenta layer, areas where the magenta image dyes form absorb a little blue yet they should only absorb green light (see page 1940). The integral mask introduces a pale yellow filter that absorbs exactly the same amount of blue into the areas where the magenta dye has not formed. This means that the magenta layer absorbs blue evenly—so the magenta image does not affect the blue any more than the rest of the picture. The overall reduction in blue is compensated for by increasing the

blue sensitivity of the paper.

In the cyan layer, which absorbs both unwanted blue and unwanted green, the mask must add not only a yellow filter (to absorb blue) in the areas where the cyan dye has not formed but also a magenta filter to absorb green. The magenta in this mask must be slightly stronger than the yellow and the mixture of magenta and yellow is effectively pink.

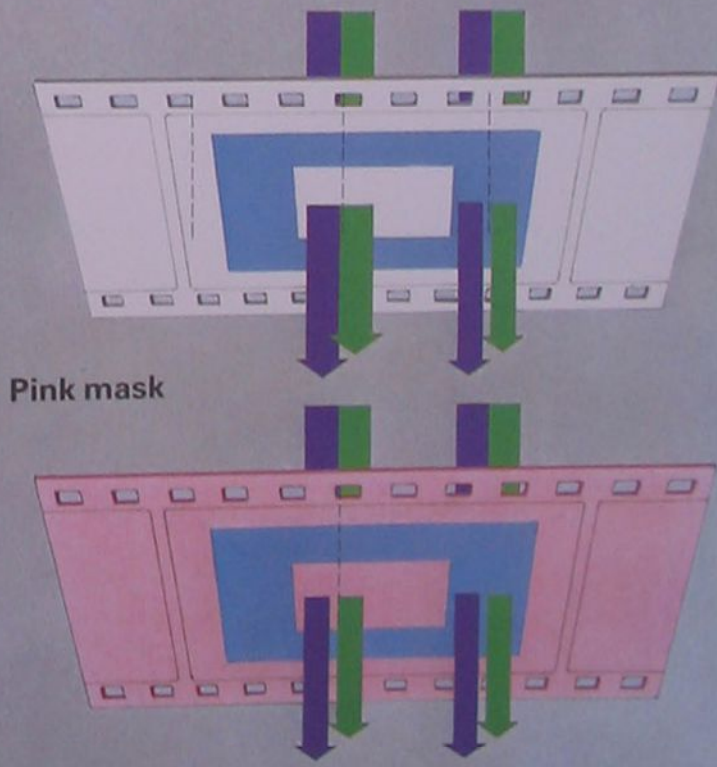
So the colour negative includes not only the three image dyes, cyan, magenta and yellow but also a yellow mask in the magenta layer

Integral masks for colour negative film



Yellow mask

Yellow mask The magenta dye should only absorb green, but it absorbs some blue. A pale yellow mask in non-magenta areas absorbs blue equally and neutralizes the effect



Pink mask

Pink mask The cyan dye absorbs considerable green and some blue. To correct this, the mask must be pink—that is, magenta (green absorbing) and yellow (blue absorbing)



Creative approach

Dance

Photographing staged classical or modern dance is far from simple, but many creative studies can be found in this vivacious art form

The world of stage dance is a fascinating one, combining the drama of theatre with the beauty of sculpture. It offers considerable photographic possibilities, and with care you can produce beautiful, graceful images. But this branch of photography is difficult and challenging, and requires careful preparation for best results.

Dance, especially classical dance, is very formal and disciplined—there are fixed ideas about which movements are right and which are wrong. This limits the range of shots a photographer can take, because only certain moments of the dance are suitable for being photographed. Although dance photography can be creative, it is often very much a matter of seizing the right moment—and to know which that moment is, it helps if you know something about dance.

Modern dance is less restricted, and offers more creative scope for the photographer. Since it is less subject to convention, the photographer is free to experiment, and there are fewer

'wrong' moments for shooting. Dance classes and rehearsals also provide more opportunity for original photography, and you can take interesting shots of dancers 'off duty', when they are not performing.

Wherever you decide to do your dance photography, it is well worth taking the trouble to prepare the ground thoroughly. The best way to do this is to go to the ballet as much as possible, but failing this try to watch classes at your local ballet school, or even read books on the subject.

One problem with all forms of dance photography is getting permission to shoot in the first place. Most theatres prohibit photography, even without flash, and even dance companies are reluctant to be photographed by someone they do not know, because the results might turn out to be unflattering. Rehearsals are easier to get into, and classes are usually the most accessible of all. It is always easier to obtain permission if you have a good reason for

taking photographs—if not for work or study, suggest that you might sell them to the local paper. Personal contacts are most useful.

If you want to take photographs of performances in theatres, you may encounter a good deal of difficulty. The larger theatres and companies are the most reluctant—start by trying small fringe theatres and minor companies. The dancers might want pictures of themselves, and they might persuade the theatres to lift any restriction they may have on photography. Once you are in the theatre, never on any account use flash—it is very distracting for the dancers and may be dangerous.

When shooting in a theatre, you may be restricted to one viewpoint, at least for most of the performance. It is rarely worth shooting from a distance, unless the set is so interesting that it warrants a photograph on its own account. Dancers can easily become lost if too much of the background is included.

As a general rule, try to sit fairly close to the stage, between three and six rows back, for example. Ideally, you should shoot from the same level as the stage, or slightly above. Never shoot from below, as this gives an unattractive angle to the shot—at least for classical dance—and do not shoot from the balcony, as this also changes the angle. It also helps to sit near the middle

Pas de deux *Catching dancers at the turn of a leap is not easy, but gives images a startling grace and beauty*





of the theatre, as the main characters will tend to spend most of their time in the centre of the stage.

It is a great advantage to know the dance piece—otherwise, you have to rely on luck and your own reflexes to catch interesting moments. By knowing the piece beforehand, you can be ready for the highlights and the most interesting poses in the dance.

In classical dance, generally the most interesting movements are made by the main characters, so it is a good idea to focus on them. Most of the movements end in a pose which is held for a split second—this is the ideal time to shoot, because it is usually when the dancer or dancers look most poised and graceful. By comparison, shots taken during the movement may well look awkward—and the position of heads, hands or feet may be wrong from a technical point of view. The classic pose in ballet is the arabesque, in which the dancer appears to be poised in mid air, and this is the ideal pose to photograph.

In all your shots, try to capture the grace and lightness of dance—if the dancers are frozen in an awkward looking pose, this can convey a false impression of the movement they were performing at the time. This applies less, though, to modern dance, which is looser in its structure—movements do not always end in held poses, and you can shoot more or less whenever you like.

At the bar Try using a slow shutter even for a slow-moving exercise—notice the effective shadow on the wall behind.

Claire Bauroff, Berlin 1931 The strong impression of movement is given by the diagonals and the 'disappearing' shadow



Lotte Jacobi



depend largely on where you sit. If you manage to find a seat between three and six rows from the front, say, an 85 mm or a 135 mm lens can be useful. With these focal lengths, you can capture individual dancers, or tight compositions of two or three. If you use a 50 mm lens, this will give you most of the stage—a useful lens for setting the scene for the dance. For classical ballet, wide angle lenses are of little use, as they give too much distortion of the subject. However, they can be used to advantage when photographing modern dance. By sitting at the front with a 35 mm or even a 28 mm lens, you can obtain the dramatic effects described above.

A winder or a motor drive can be very useful in the theatre—the noise is usually drowned by the music—and can help you capture shots you would otherwise have missed, because it is sometimes very difficult to know when to press the shutter. A spot meter is also an advantage, because if you expose on an average reading the exposure is unlikely to be correct for the dancers, who will usually be either lighter or darker than the rest of the stage.

The film you use is a matter of preference, but black and white is usually easier because of the often low light level in theatres. Monochrome is also suited to the type of image which dance photography produces—simple, clean lines give strong powerful images. Slide or colour negative film though, can detract from the image itself, and a patch of background colour may interfere with the unity of the photograph.

Sometimes, however, colour film can give striking effects when used with long exposures. By shooting with a two or three second exposure time, you can

On point The tension and balance of the dancer's feet are well conveyed here.
At rest Unplanned shots like this can give an almost birdlike impression of lightness—note the grace of the skirt.
Sitting Soft focus enhances some images

Here, too, though, it is useful to know the dance beforehand. Instead of taking straightforward shots, you can move in close with a wide angle lens, and take dramatic photographs with strong depth. One character may well dominate the scene while others remain, though still in view, in the background. When taking this type of shot, watch the lighting, which may be less bright in the foreground. But this can also be used to dramatic effect—the foreground figure can be dark and quite low key in contrast to the brighter ones in the background.

Composition is important in theatre shots, but you may not have time to compose carefully, because of the rapid movement. You can get round this, however, by cropping shots at the printing stage. Furthermore, when a dancer holds a pose for a split second, you have more time to adjust composition.

The lenses you use in a theatre







photography—above all, they allow you to change your viewpoint. They are also easier to get into—most companies agree to being photographed in rehearsal, though it is still a good idea to have a valid reason for doing this.

Rehearsals are of various kinds, and vary from routine rehearsals to full dress rehearsals. The former may be held either in the theatre or in a dance studio, while the latter always takes place in a theatre. There are also special rehearsals called *photo calls*, held specially for photographers. You may be able to go to one of these, but you have to be invited—normally, the best plan is to approach the public relations department of the dance company.

If you obtain permission to attend a rehearsal, make sure you get there early. This allows you to capture a variety of interesting shots of the dancers when they are not actually dancing—they may be coming out of the changing rooms, or stretching, putting on their shoes, and doing various warming up exercises. Interestingly, the dancers' bodies are often more striking and sinuous when they are out of the context of actual dance. The studios are often lined with mirrors, and you can catch effective reflection shots of dancers arranging their hair or stretching in front of the mirror. Take care to keep out of the picture yourself.

When you shoot a rehearsal in a studio, stay on the edge, to avoid getting in the way of the dancers. This to a certain extent determines your choice of lenses, as you cannot get in really close. One possible approach is to start with overall shots, covering most of the studio. Here, a wide angle lens is useful, but avoid superwides, as the resulting images might make you unpopular with the dancers!

Once you have set the scene, you can concentrate on the individual dancers whom you find most interesting. A short

produce swirls of colour, effectively conveying the graceful movement of dance. This is a rather hit-and-miss technique, but it can give spectacular results. Indeed, the blurred 'impressionist' images it gives are reminiscent of a famous impressionist painter's who specialized in ballet dancers—Degas.

If you find that shooting from the same viewpoint in the theatre does not give you the variety you would like, you might try taking photographs off stage, in the wings. You can for example capture some interesting shots of dancers about to go on stage, tensing themselves in preparation for their dance—or, alternatively, catch the release of tension as a dancer leaves the stage. It is also often effective to shoot both the stage and dancers waiting in the wings, but the contrast in lighting between the stage and the wings can pose problems, although there may be enough spill of light from the stage.

Rehearsals and classes offer much more variety and scope for creative

Shadows By photographing only shadows you can produce ghostly images, like this backstage glimpse

Backstage It can be revealing to catch dancers in natural poses—these girls are waiting for their cue to go onstage



to medium telephoto lens is suitable for this. You can take long shots of the dancers' whole bodies as they perform movements, or you can move in a little closer and take head and shoulders shots. Since rehearsals are very repetitive, you have many chances to capture the same movement.

Dancers, because of their training, tend to use their hands a great deal while talking—you can exploit this when photographing them, especially if they are not aware that you are concentrating on them. Sometimes, they use their hands to convey the movements their feet will perform—another possibility for interesting shots.

Rehearsals are often mixed, but some classes may be segregated some of the time. This offers an opportunity for making studies of male or female dancers individually. Their bodies are quite different, and when they perform their separate exercises they often show fascinating grace or power, in their different ways.

In between exercises, some of the

Moment of tension *Waiting for the moment of maximum effort can produce expressive studies of movement*

In mid air *Dancers perform gazelle-like leaps—but you need fast film to freeze the action in the low light*



dancers may go to another room to relax, or take some refreshments. Try to go and talk to them, and take shots of them sitting in armchairs, or draped over divans. Here again, out of the context of the stage the sinuousness of their bodies is all the more striking. And when they finish rehearsing, wait a while before leaving—they usually sit around the room exhausted.

Apart from the dancers themselves, it is also worth photographing their instructor or choreographer. Dance is essentially an external, visual expression of something abstract and non-visual—you might try capturing this. One way could be to photograph the choreographer thinking, constructing the movements of a new dance. An expressive study might be a shot of the choreographer sitting down, obviously thinking, while dancers are whirling about in the background.

In certain rehearsals you could even try special effects—multiple exposure with a strobe light is one possibility, though this obviously has to be arranged beforehand with the dance company, since flash is as distracting in rehearsal as in performance.

If you cannot obtain the permission to photograph professional dancers, you can always try photographing your local ballet school—most would be only too glad to be photographed. Bear in mind that it is a good idea to give out prints to the dancers, as thanks for having been allowed to photograph them. Many of the amateur companies and schools dance to an extremely high standard, and there is every chance that your pictures will be as interesting as those of a professional company. In the summer, too, amateur dance companies often hold outdoor performances, which pose less exposure problems than theatres—and dancers against green, leafy backgrounds can look very striking.

Making calotypes

The calotype process was developed as long ago as 1841, but calotype prints made by following original procedures can be particularly attractive



Richard Morris

A calotype is a paper negative coated with an emulsion that you make and process yourself. The original calotype process was developed by Talbot in 1841, but you can recreate his early experiments to produce, as an alternative to modern processing effects, attractive images reminiscent of those pioneering pictures.

The bigger you make the original calotype negative the better the image quality will be, so a plate- or view-camera is necessary for making the exposure. Bright sunlight is also essential for the exposure since the emulsion and paper are slower than modern materials.

The calotype negative can be contact printed on to ordinary bromide or RC paper, but, with the formula given below, you can coat your own salt paper to give your prints even more of a 'period' look. The first step, though, is to make the paper base.

The paper base

It is important to use top quality paper for making calotypes. Virgin wove that is acid, alkali and bleach free has to be used. Although coarse fibred recycled paper may seem satisfactory, it contains chemical impurities which interfere with the calotype process. Paper with good wet strength is essential.

The ideal paper if you can find it is 'rag weave gelatin' which contains a high proportion of gelatin. This prevents excessive absorption of chemicals. Other forms of hypo-free, chemically inert paper can be obtained from art shops

but they can be expensive and are generally only available to order.

However, there are two alternatives.

If you have any discarded bromide singleweight prints, you can actually strip the emulsion off and use the base. Place the old print for five minutes in a 1 + 1 solution of household bleach and boiling hot water. Let the print soak well and when it has cooled somewhat, rub the emulsion surface lightly with gloved hands. Then add table salt—at the rate of 17 grams per litre of solution—to the

Exposing a calotype A typical exposure time for a calotype is five minutes at $f/22$ in bright sunlight. The result of this exposure is shown above



Dave King

stripping bath and agitate the print for two minutes. Both the image and the emulsion should soon dissolve away, but if not, simply add some more fresh boiling bleach and salt solution. Rinse in running hot water and when you feel the rougher paper base below, the stripping is complete. Then soak the paper in a bath of table salt solution (250 g per 500 ml water) for five minutes. Give the paper five minutes in a hypo clearing agent and follow this with a wash for 45 minutes. Dry the paper under pressure to keep it flat.

Your second option is to use plain white Conqueror Wove 60 gsm paper which gives quite satisfactory results in spite of being mildly acidic. There are some costly rag weave paper made in the USA but these products may not be gelatin coated and the chemical content is not specified.

Coating the emulsion

Absolutely clean dishes and accessories are essential throughout the coating process, as the slightest contamination will ruin your efforts. This means providing separate utensils for each chemical. Use disposable polythene gloves to protect your hands when handling the chemicals. All mixing, coating and processing is done at a standard 20°C. Dark amber or red safelighting should be used throughout.

Start by cutting your paper to a size slightly bigger than is needed for the negative you wish to shoot or print. Cut a notch in the top right hand corner of the sheet so you can identify the emulsion side in the darkroom, in the same way as sheet film. Prepare enough paper to make up a batch.

The coating itself is done in two stages. First you apply a silver iodine coating to one side only (it is important to keep the back clear). When this has dried, coat the sheet with gallionitrate solution.

To prepare the solution for the first stage of the coating, dissolve 2 g silver nitrate in 50 ml distilled water. Use a good quality brush to coat this solution evenly on to the paper. To avoid later contamination—and possible cleaning problems—you may prefer to use clean cotton wool pads throughout instead. Pushed into the ends of glass or polythene laboratory tubes, these swabs are known as buckle brushes. Simply replace the used cotton wool for each coating application. Lay the coating evenly or patchy negatives will result.

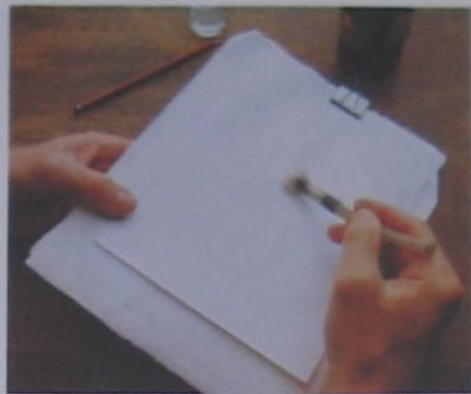
Use blotting paper to remove any excess before leaving the paper to dry—use fresh blotting paper on each occasion. You may find it worthwhile to heat the room—or fan the print itself from a distance with a hairdryer—to speed up drying.

When the nitrate coated surface is touch dry, immerse the paper for about 1½ minutes in a bath consisting of 20 g potassium iodide dissolved in 350 ml distilled water. Agitate the print to displace bubbles under the paper as they may result in staining.

Preparing a calotype negative



1 Though you can use hair brushes for coating and processing operations, buckle brushes—made by stuffing cotton wool in to the end of a tube—are better



2 Cut paper slightly larger than needed and rule off the final, trimmed size. Coat the paper with silver iodide solution, blot it and leave it to dry



3 When touch dry, immerse the paper for 1½ minutes in a potassium iodide solution. Then thoroughly wash the paper and leave it to dry in darkness



4 Under red or amber safelighting, coat the paper with the gallonitrate solution. Pre-exposure to sunlight can be given to increase sensitivity



5 Give the sensitized calotype paper a brief wash and then lightly blot it. Keep the paper cool and in darkness until it is used



6 Before use—and under safelighting—trim the sensitized paper to the required size. The emulsion side is delicate when wet so handle the paper carefully

The emulsion now undergoes a chemical exchange (redox reaction) to leave potassium nitrate and silver iodide.

Carefully transfer the paper to a wash and change the water at least once every five minutes and leave it to soak for about two hours. This removes the potassium nitrate and leaves behind the silver iodide. The paper is now light sensitive to a degree, so drying and storage should be carried out in total darkness. For convenience, let the treated paper air dry overnight. Blotting off excess water after the wash helps to speed up drying and reduces mottling. To reduce curling, weigh down—or pin down—the paper edges.

Inspect the dried, iodized paper for imperfections by holding it around 1½–2 metres from the safelight. Discard any sheet with pinholes, stains or patches in the coating. Only sheets which are completely free of blemishes are worth keeping for the second coating stage. Store the iodized paper in a cool, dry, dark place until you are ready to give the second coating, shortly before making your exposures. Fortunately, iodized paper has good keeping properties, particularly when kept cool and dry.

Second coating

Before the second coating, you can increase the sensitivity of the paper by exposing it to direct sunlight for 15 to 30 minutes. This is rather like pre-fogging or 'flashing' films to increased speed, and is called *hypersensitizing*.

Next, prepare the silver gallonitrate solution. This is made in two parts which are then mixed together and diluted for subsequent use.

To make the first part, dissolve 2 g of silver nitrate in 20 ml distilled water, and stir in about 3 ml acetic acid. To make up the second part, which is a saturated solution of gallic acid (not pyrogallol acid), simply add gallic acid powder to 25 ml distilled water, stirring briskly but avoiding splashes. Saturation point is reached when a precipitation starts to appear in the bottom of the mixing vessel. Let the solution settle and then pour off the saturated gallic acid, which you will be using.

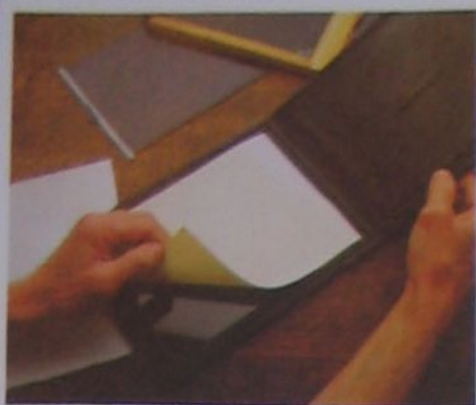
Just prior to exposure mix a small amount of the two solutions in equal proportion. This mixture may be diluted by as much as 1 + 4 with distilled water for spreading on the iodized paper. By experimenting with the concentration

you can achieve different speeds in your calotype. Mix only sufficient for the number of sheets that you have to coat because the mixture oxidizes fairly swiftly. Discard any unused solution after about 15 minutes.

Talbot called the silver gallonitrate mixture the 'exciting liquid' as it basically acts as a catalyst. It should be applied with clean buckle brushes to the emulsion side of the iodized paper and then left for about half a minute to penetrate and take effect. If the paper is stored for a long time, or the neg gives patchy results, extending the standing time to 1½ minutes may help. Try to avoid getting exciter liquid on the back of the iodized paper because it will leave a stain which causes a drop in sensitivity. For this reason you might prefer to lay the iodized paper on a sheet of blotting paper when applying the coating.

Wash the sensitized calotype paper for one minute and then lightly blot. Then cut the calotype to fit the darkslide of your camera. Feed the calotype, emulsion side out, into the darkslide—the calotype is particularly delicate in a wet state, so take care when doing this. As

Processing and printing a calotype



7 Calotype paper can be loaded in exactly the same way as cut film. To identify the emulsion side a pencilled 'X', or notches cut in one edge, are useful



8 Under safelighting, develop the exposed calotype by brushing the paper first with silver nitrate then with gallic acid from the gallonitrate mixes



9 Next, give the paper a short wash before fixing the image in plain non-acid, non-hardening 'hypo' solution, following with a long wash



11 Place the calotype negative in contact with a sheet of salted paper (or ordinary print paper), with the emulsion sides together, the calotype nearest the glass



12 Take the frame in to daylight to make the exposure. Its progress can be checked from time to time by lifting one corner, but in the shade



13 After exposure, return to darkroom lighting and remove the salted paper from the frame. Wash the salt print in water, and then fix it

you may risk scratching the calotype with the darkslide blade do not replace this. Instead, load the darkslide directly in to the camera you are using—this should not prove difficult, or messy, under normal safelighting.

You must work in this rather odd way because exposure is made while the calotype is still wet and at its most sensitive. To get round later focusing problems, preset and lock the focus and aperture on the lens before taking the camera into the darkroom to load. You then need only return the loaded camera to its tripod and make the exposure.

If you are recording several images, keep the remaining calotypes cool between final coating and exposure since heat will cause fogging.

Exposing the negative

Exposure of a calotype negative is by trial and error as no two calotypes behave in the same way. For instance, try exposures of up to one minute at $f/8$ in bright sunlight—but be prepared for very much longer exposures in overcast or shaded situations. The ideal is a very faint image that is just barely

visible on inspection after exposure. If the image is any more than a faint image outline then the negative is overexposed and will be too heavy when developed. Examine the calotype in the shade—not sunlight—or fogging will result.

Use fresh calotype paper rather than attempt to double expose any negative which seems to be underexposed after you have made an inspection.

Processing the negative

To develop the calotype you use the silver gallonitrate preparations that made up the exciter liquid in the second coating stage. For development the two parts are kept separate and applied with individual buckle brushes. This can be carried out in safelighting. Remove the calotype from the camera or darkslide and wipe the emulsion with the silver nitrate solution, covering the image area evenly and once only. Then, do the same with the gallic acid solution and leave the negative for a minute or two. Using clean cotton wool, repeat the applications and leave the print for a further minute. Then coat the wet emulsion with the gallic acid solution only, continuing the application until a strong image is

produced. This should have clear bold lines and well defined clear highlights and good vigorous contrast. Judge the progress by safelighting—do not take the negative into daylight yet.

When development seems complete give the paper negative a four minute wash. Afterwards, fix it in a plain non-hardening sodium thiosulphate fixer bath. This needs to be about half strength because the image is not stable in the presence of concentrated hypo. You can make your own fixer by dissolving 120 g plain hypocrytals in one litre of water. Divide this into two baths and give the calotype four minutes in each, agitating frequently.

A long wash should follow—45 minutes is recommended. For good long-term keeping qualities you can use hypo clearing agent.

Calotypes must be dried gradually, at room temperature. Do not use a hot drying cabinet. Retouching, which is often necessary where chemical impurities may have left pinholes, is now carried out on the negative. Useful improvements include blocking out the sky if this has low density. Any proprietary opaque medium can be used.



10 Dry the paper ready for printing. To improve translucency, melt a little beeswax and spread this into the back of the calotype negative



14 After fixing, the purple coloured image of the exposed salt print (left) turns to a warm yellow colour (right). Give a long wash before drying

Making prints

The next stage is to make a positive print from your calotype negative. Although you can use calotype paper for this stage, results tend to be rather contrasty and less pleasing than those made on easily prepared salt paper. Calotype negatives may also be printed on to ordinary fibre-based or RC papers.

You can use the same paper as used for the calotypes for your salt prints. Cut sheets to printing size and prepare the paper by soaking it in a salt solution consisting of 4 g table salt dissolved in one litre of water. Soak your paper for six minutes and hang it up to dry.

Then, in safelighting, prepare the light sensitive emulsion by dissolving 10 g silver nitrate in 80 ml distilled water. Stir well until it has thoroughly mixed in. Then slowly—drop by drop—add 8 ml of 0.880 strength ammonia and stir the mixture until the solution clears. Pour 10 ml distilled water into a separate measuring cylinder, and carefully add 3 drops of concentrated nitric acid, stir-

ing slowly with a glass rod and avoiding splashes. Add this dilute nitric acid solution to the silver ammonia solution in the first mixing vessel and mix until it is uniform. This emulsion is now ready to be coated on the salt-impregnated paper you have prepared.

One good even coating is enough and while this is drying you can be polishing your contact printer frame ready for use, and waxing the calotype. Waxing makes printing the calotype easier. Melt some pure fresh beeswax and rub it into the back of the calotype. The paper will absorb the wax and the calotype is thus made more translucent. Try to apply the wax evenly because areas that lack uniformity will print through, so creating light and dark patches on the final print.

To make the print, tape the calotype by two corners or one side, to a sheet of salt paper. Be sure to put them emulsion to emulsion and place them in a suitable contact frame or printer. The calotype negative must be uppermost.

Make the exposure outside and in bright sunshine if possible. The print image will gradually darken in bright sunlight. Inspect its progress every five

minutes or so by carefully undoing one part of the frame and peeling back the calotype and paper sandwich. If the image is not sufficiently dark, return the frame to the sunlight until the required density is reached. The image appears to be slightly purple at this stage.

When you are satisfied with the density, return to the darkroom and separate the calotype from the print. Wash the salt print in two or three trays of water. These washes should be short and of about one to two minutes duration, because the water will be very milky as the non-image forming silver is removed from the print. When the water appears reasonably clear, the print is ready for fixing. Use the same thiosulphate fixer solution as used for the calotype. After four or five minutes in this fixer, the image starts to go yellow. Leave the print in place for another 1½ minutes before washing it. A long wash is necessary unless you use a hypo clearing agent to reduce the time needed. Then dry the print at room temperature. Use a household iron on the rayon setting to smooth and flatten the print as it probably will have curled up in drying.



Newhaven fisherman Hill and Adamson's famous seashore portrait—one of 1500 calotypes taken by the duo



World of photography

Edward Weston

By looking at the world around him in a fresh way, Edward Weston produced, over the course of 50 years, some of photography's classic and most memorable images

Edward Weston's wonderfully clear pictures of such simple objects as shells and vegetables, his incredibly detailed landscapes, and his sensuous but direct nudes, have been a source of inspiration to many. With his fresh and straightforward way of looking at things he helped to free photography from its previously slavish imitation of 'art'.

The beginnings of this great career were simple enough. In 1902 he was given a Kodak Bullseye 2 camera by his father—a common enough gift at the time, but one that shaped Weston's life from then on. Soon after he started playing 'hookey' from school to photograph the streets of his native Chicago. He was also armed by then with another camera, a 5 x 7 inch view model, and a tripod he had bought with carefully saved pocket money. Edward Weston had found his vocation, which he proceeded to pursue with passionate singlemindedness.

An early move to try new ground was to leave home at the age of 20, going West to join his sister May and her husband in Tropico, then a small but growing suburb of Los Angeles. His photographic career started with a postcard camera, taking pictures door-to-door, of householders, their pets and



Edward Weston A soft yet very compelling and intriguing portrait taken by his son Brett in 1936

Tina Modotti This shot, taken in 1922 and exquisitely composed, reveals Weston's mastery of the pictorialist style—a style which he was to reject only one year later



possessions. He did spend several months at the Illinois College of Photography but became disenchanted with the course. In 1909 he married Flora Chandler, with whom he had four sons. By 1911 he had set up a studio for commercial portraiture which, most importantly, made enough to support his experiments in creative photography.

His style at that time was heavily influenced by the smudgy, romantic style of the Photo-Secession (see pages 1504 to 1508). Indeed, Weston achieved considerable international success with his pictures in both group and one-man exhibitions. He even dressed the part of the artistic photographer, he was to admit ruefully later, sporting a cape, cane and velvet jacket.

By 1919 he was beginning to reject these artistic conventions, gradually feeling his way towards a much more direct and graphic style, particularly in his non-commercial portraiture. His rejection of the 'artistic' took a quite definite form. His youngest son recalls helping his father about this time to scrape the emulsion off prizewinning negatives so that the glass plates could be used to repair studio windows that had been smashed by him and his brothers! Weston never had qualms about destroying earlier work if he no longer liked it.

A further move towards establishing his own particular way of seeing came in 1922 when he travelled across the country to visit his sister May, then living in Ohio. Here he took his famous pictures of the Armco steelworks. Clarity of form and a feeling for volume and shape replaced the moody and one-dimensional approach of his earlier work. He refined this formula for the rest of his life in his search for a truth which he declared essential for the creation of photographic beauty.

Travelling on to New York he met Steiglitz, the self appointed guru of the Photo-Secession movement. He was encouraging, but, as Weston realized, had nothing to offer him. He was now his own master and confirmed in his determination to go his own way.

And on he went—this time to Mexico. Now he was to play hookey from his marriage, already damaged beyond repair, and, more painfully, from his sons. In 1923 he left for Mexico City with his eldest son Chandler and his pupil and mistress, Tina Modotti—an Italian born minor star of the silent screen, who later distinguished herself as a photographer and revolutionary.

Tina had visited Mexico City the

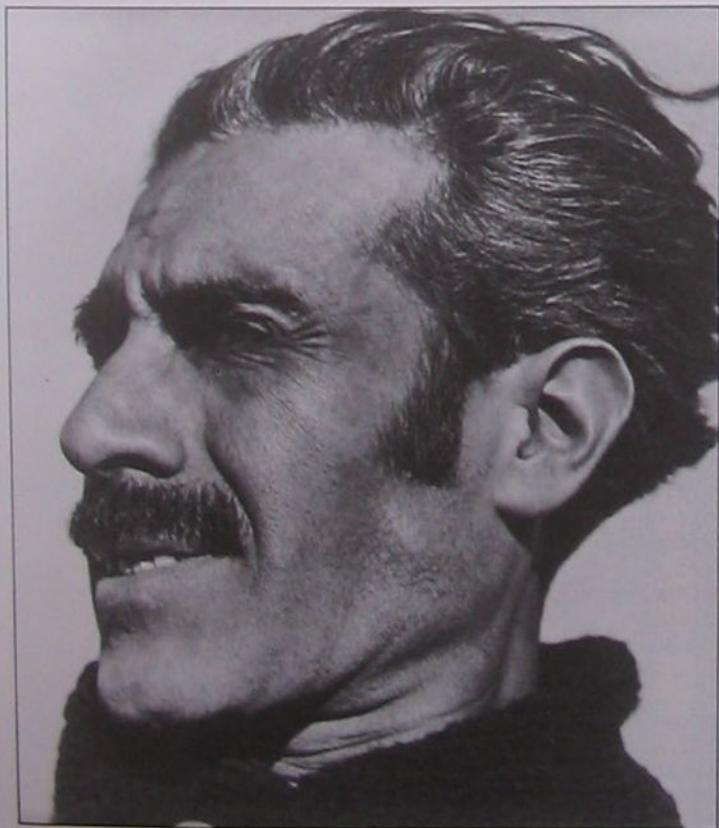
previous year and met a circle of revolutionary artists responsible for what was called the Mexican Renaissance. Through the influence of these friends, such as muralist Diego Rivera, she was able to mount an exhibition of Weston's prints at the Academia de Bellas Artes. To his astonishment they were not only rapturously received but, more importantly, actually sold. Weston could dedicate himself in earnest to creative photography in a country where his work was appreciated.

But even so, the Mexico years were not easy. Despite his newly won fame, his prints sold only sporadically and he was forced back on commercial portraiture to keep going. 'Tomorrow's tortillas depend on that sitting', he wrote bitterly in his daybook when one client cancelled. He also came increasingly to dislike the retouching necessary to make 'an ancient American woman of questionable age look like a vivacious señorita!'

More positively, he had made some very forceful portraits of his new circle of artist friends. Many were taken outside in the strong Mexican sunlight with his $3\frac{1}{2} \times 4\frac{1}{2}$ inch Graflex camera which he always used for moving subjects, hand-held with exposures of up to $1/10$ second at $f/11$. However, he always preferred to work with his 10×8 view camera as he could see his subject more accurately through the larger ground glass screen. Also, the longer exposures helped him to achieve greater overall sharpness and depth of field. He preferred this format because he always contact printed—retouching was absolutely taboo. To make a 10×8 print from his $3\frac{1}{2} \times 4\frac{1}{2}$ negatives he



Edward Weston/1981 Arizona Board of Regents, ©Center for Creative Photography



Armco Weston's series on the great steelworks so excited him that he wrote in his diary, 'That day I made great photographs'. He moved in close so that the works dominated the frame. He then recorded them with a clarity which signalled his break with contemporary art photography. He also rejected the Pictorialist fondness for manipulating prints

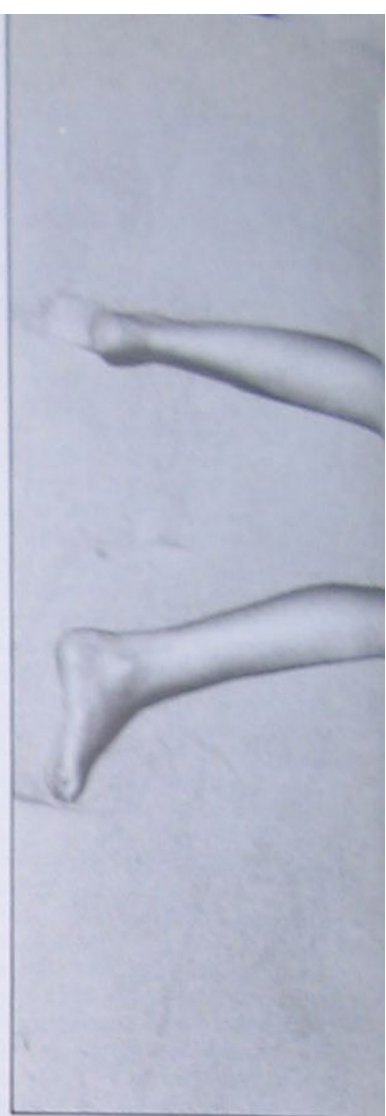
General Galvan
A good friend of Tina and Edward's in Mexico. Weston took this with his Graflex just as Galvan was about to take aim with his gun for a practice shot

would first make a 10×8 fine print and then rephotograph it.

He also rejected his expensive soft focus lenses in favour of a cheap second-hand one that stopped down to $f/64$, the smallest aperture possible. His only link now with the pictorial mode of photography was in his choice of the expensive platinum and palladium printing papers. Imported from England, they were prized for their rich luminous effects. When the supply dried up in the early 30s Weston turned to chlorobromide glossy paper at the suggestion of his son Brett.

Throughout his life Weston always emphasized the importance of a simple technique. He had so mastered his own that he 'felt' his exposures rather than calculated them, finding this intuitive system more accurate than any meter.

Weston's lack of finances in Mexico did not allow for many photographic expeditions. So he turned his camera on to his immediate surroundings—Tina sunbathing, views of his own backyard and cloud formations. It was during this time that Weston first began to experiment with still lifes. Working with Mexican craftwork and toys and, more successfully, even with his toilet which he recorded as a 'glossy enamelled



receptacle of extraordinary beauty'!

Weston's Mexican sojourn was broken by a few months in San Francisco and Tropico, now very suburban, to visit his sons. He returned to the US for good in 1926, his relationship with Tina finally over. Despite the small creative output during his last three years there, his contact with a freer peasant society had affected him profoundly, heavily influencing his simplicity of style.

At a joint exhibition with Brett at UCLA he met a local artist, Henrietta Shore, who painted still lifes. The chambered nautilus and other shells which he came across in her studio fired him to create some of his most exquisite images. 'Not many people', he had written earlier, 'realize that good photographs are made with one's brains.' He experimented tirelessly with light and background to create a series of prints, remarkable for their simplicity and

Green pepper One of the photographer's most famous images and a fine example of Weston's ability to transform the appearance of even the most ordinary objects

Nude A classic study of Charis Wilson, Weston's model, mistress and later his wife, photographed on the sand dunes at Oceano, California, in 1936

Wrecked car The experience gained on the Guggenheim project gave Weston confidence to move away from detail to photograph the landscape itself, tackling even ugly, seemingly unphotogenic subjects with success

Driftwood stump This powerful photograph, taken in 1937, illustrates Weston's concern to reveal the underlying life and dynamism of the natural landscape



sensuous power. Weston had invented a new way of seeing, investing his subjects with a solidity and reality that was almost supernatural. To achieve this effect he set his lens at the smallest aperture and often used 4½ hour exposures.

For the next few years he worked not just with shells, but also with a variety of vegetable forms. Indeed, so powerful were many of his images that some admirers of his work were horrified that the vegetable subjects found their way on to Weston's supper table. To their accusations of cannibalism, Weston would reply that he 'could not afford to buy them for art's sake'.

He also applied this close-up approach to his nude studies, which were characterized by his interest in conveying movement. He would never pose his subjects. Instead he waited for what he described as 'the significant moment'. He allowed his models to move, even dance, to find poses which were comfortable and natural for them. All this produced images worlds apart from the unnatural 'art' poses of the time. This was also no doubt in part due to his close relationship and emotional involvement with the subjects, be they friends, family or lovers.

In 1928 he began the series of Californian landscapes and landscape details that fascinated him for the rest of his life. First it was the rocks and Joshua trees of the Mojave desert. Then, the following year, he moved to the artists colony of Carmel and from there

Edward Weston/1961 Arizona Board of Regents, © Center for Creative Photography



explored the wild coastal areas of Big Sur and Point Lobos. Again, it was the dynamism inherent in natural forms that he felt and captured on film as he explored the twisting shapes of cypress roots and kelp and the strange patterns of eroded rock formations.

Weston began to receive widespread recognition for his work and was invited to exhibit at numerous venues all over the US. In 1932 he had his first photographic book published. The same year the influential *Group f/64*, named after the smallest camera aperture, was founded by Ansel Adams and Willard van Dyke. The group was dedicated to capturing the image depth and clarity that Weston had been fighting for since the early twenties.

At the age of 46 he met Charis Wilson, the last and perhaps greatest love of his life. When they met for the first time at a concert, Charis was immediately struck by the fact that Weston seemed the most alive person in the room. Like others before, she became his model and his mistress. She was the subject of his great nude series photographed in the dunes at Oceano, on the Californian coast.

Recognition from the art world came to Weston when he was awarded a Guggenheim fellowship worth \$2000 to photograph the American West—the

first ever granted to a photographer, which was renewed the following year. He and Charis, with his son Cole as driver, covered a huge distance from Washington to New Mexico photographing subjects as diverse as vacant lots in Hollywood to the rock formations of Death Valley. The book of their travels, *California and the West* was published in 1940 with text by Charis and photographs, of course, by Weston. It was a celebration of a partnership now cemented by marriage.

A year later they were on the road again, this time to illustrate a limited edition of the great American poet Walt Whitman's mystical poem *Leaves of Grass*. They covered the eastern seaboard of the US, from Maine to Louisiana. A funereal note creeps into these pictures, many of them of cemeteries and decaying Louisiana mansions. The sense of disquiet and foreboding apparent in his Californian landscapes of the war years also shows through in a series of surreal nudes of his wife and family, the best known being that of Charis lying on a sofa wearing a gas mask.

His greatest accolade came in 1946 with a major retrospective exhibition at

the Museum of Modern Art in New York. Moreover, his friend and erstwhile pupil Willard van Dyke made a film on his work, entitled *The Photographer*.

But Weston's photographing days were numbered. He had developed Parkinson's Disease, a progressively debilitating nervous disorder. He took his last photograph in 1948—of rocks and pebbles at Point Lobos. He and Charis had parted and for the next decade he was cared for by his sons who helped and eventually took over, under his direction, his printing projects. He died on 1 January 1958.

Weston was described by one of his friends as a 'small man... with a big camera.' Sons, wives, friends and numerous mistresses all played their important part in a life dedicated to his greatest love—photography. His penetrating vision influenced a generation of photographers from his son Brett to the Mexican Manuel Alvarez Bravo. For Weston, photography was 'that thrill of finding beauty in the commonplace' and from this discovering that, 'Clouds, torsos, shells, peppers, trees, rocks, are but interdependent, interrelated parts of a whole, which is life.'

Civilian Defence One of a series of bitter and almost surreal pictures, here of his wife, Weston took during the war years in and around the house on Wildcat Hill



What went wrong?

Shadows

Shadows make atmospheric pictures in their own right. Homer Sykes analyzes three photographs which feature shadows, and gives some ideas about ways in which they could all have been improved

The exposure is incorrect here—it is slightly over-exposed, giving the washed out effect. The photographer ought to have warmed up the picture with an 81A or a 81B filter. I use them all the time while shooting colour, even with Kodachrome which is often thought of as being on the red side. In this picture the eye is drawn by the shadow very effectively from the bottom right-hand corner of the photograph along the shadow of the tree trunk to a point on the red brick wall. Everything above the wall—house, trees and bushes—are irrelevant to the composition and only confuse the overall design of the picture. The photographer should have framed them out. A couple of paces to the right and a slight change of camera angle to include all of the patterned door would have helped create a pleasing picture. It's possible that the door was in the viewfinder when the picture was taken and that some of it has been lost behind the card mount. One must always remember when shooting a tight composition that mounts make the picture size smaller.



Evening sunlight, an old coach lamp, strong shadows, a whitewashed wall, three window frames and a door. All the elements of what could be an interesting and classic photograph. I'm afraid in this case it simply does not work. There is nothing in the photograph that holds together. The photographer has managed to jumble all the elements: the huge dominating shadow of the coach lamp, slap in the middle of the picture, looks plain ugly. There seems to have been very little thought about the composition, and the wrong lens has been used. In this type of picture strong and simple design are important.

It would have been better to concentrate on the shadow and the coach lamp, and to isolate them from the bits of the windows and other irrelevant shadows. Perhaps it would have been better to shoot this picture from the left side and have the coach lamp in the background with sunlight bursting through. In order to achieve a strong simply designed picture you must be prepared to move about a bit, and to try different lenses.

The main and most obvious problem with this picture is that there is no central point of interest. One looks at it and is puzzled. What is it? What is the photographer trying to say? I suspect that a 50 mm lens was on the camera and only one frame was taken from about 3 m. Subsequently, in my opinion far too much wood texture to the left has been included, and the sky and the out of focus branches should have been framed out all together. They only confuse the picture.

The shadow falls across the picture by accident rather than design and the end result is a surprise and it looks like it. The picture should have been created rather than snapped. Decide what interests you and then concentrate on it.

In this case I would have used a longer lens—say 105 mm—and moved slightly to the right, concentrating on the patterned wall, bringing in a little of the wood texture and the shadow to help the overall content and design. The end result would, I think, have been much more worthwhile.

The photograph was taken at Saffron Walden, Essex, England, on Kodachrome 64 film.







Creative approach

Flowers

To the naked eye a flower is a thing of great beauty, but without creative treatment, photographs may fail to convey their full natural attributes

further—especially since small apertures and slow shutter speeds are usually called for. Attaching the stem of the plant to a stake can minimize the problem and it may also be worthwhile erecting a makeshift wind screen to shelter your subject.

When photographing in the garden there are a number of alternatives open to you. Flowers can be photographed as part of the garden (see page 1248) or they can be approached at such close range that they appear only as brightly coloured abstracts. With an extreme close-up, depth of field becomes severely limited but then it can be effective to break the rules, using a wider aperture than would normally be appropriate and just concentrating on abstract shapes and colours. A similar approach is to photograph a mass of defocused, colourful flowers filling most of the frame but with a sharp blossom visible through a gap in the background—possibly centred in the frame.

Extreme close-up The photographer took care to make sure the stamen was sharp but deliberately defocused the petals to create this colourful study.
Worm's eye view A group of flowers may look appealing but will not necessarily make a creative picture. Here a low viewpoint and backlighting produced more impact



John Sims

Being so rich in visual qualities, flowers are obvious subjects for photography. Aesthetically they symbolize natural perfection and require no more than careful technical treatment so that the images recreate a full natural beauty. But, like all other photographic subjects, flowers respond best to imaginative treatment and unless you have an interest in them purely as botanical specimens, there is no reason why you should not turn your camera on flowers solely to create exciting images.

Exploring the colourful world of plants does not mean that you have to go on hikes through woods, or pay visits to botanical gardens. Your own back garden is likely to be full of potential—alternatively, there is a whole world of still life photography that is opened up by taking living or dried flowers into your home or studio to photograph under controlled conditions.

The two physical qualities of a flower that are most responsible for its appeal are form and colour—the curves of the stem, petals and stamen, the arrangement of blossoms or flower heads on a stalk and the variety of colours and their combinations. However, photographing these qualities is not as straightforward as it might at first seem.

One of the most common technical problems involved with photographing flowers in the garden is that of movement. On all but the stillest day, movement can be detected when photographing a blossom at close range, and the magnifying effect of close-up equipment aggravates the problem



Colin Molyneux

The sort of approach to flowers that defies accurate representation of the species can be pursued in a number of other ways. For instance, eye catching results can be achieved by shooting a flower from a worm's eye view. By using a wide or ultra-wide angle lens from ground level and at the closest focusing range your lens permits, you can allow the flowers and leaves to dominate the frame and show the characteristic convergence of the wide angle lens. Extra impact is achieved by photographing into the sun so that the blossoms are backlit.

The choice of background is very significant with shots like this. A low viewpoint may work particularly well using a fence as a background—if it is constructed of vertical planks of wood, the shot can be framed so that these planks converge towards the centre of the photograph. Backgrounds can also be used to provide contrasting texture and colour. A mossy, weathered stone wall, for instance, provides an interesting backdrop to the soft texture and pure colour of a bright blossom. The relationship is more obvious if the two are fairly close to one another so that they are both within the depth of field.

The colour of a background is also an important factor in controlling the mood of the photograph—even if it is totally defocused. A red flower will stand out particularly well if photographed against a dark green background, while a bright yellow blossom will seem to vibrate against a dark background—perhaps a stone wall. To make a subject really stand out it might be best to have a totally black background—this can be achieved by photographing against an area of shadow, or perhaps deliberately creating a shadow yourself.

Another way of creating a different background is to use a telephoto lens and focus on a single bloom, using a wide aperture to allow all the flower heads behind it to appear as defocused patches of colour. If you use a mirror lens for this, the background highlights will take on the characteristic 'doughnut' appearance created by the reflex lens design.

Choice of lighting is, of course, crucial in order to take creative pictures of flowers. Backlighting, sidelighting or the warm, low light of a setting sun can all be exploited to produce dramatic effects. However, many naturalists prefer to photograph flowers in soft, diffused lighting so that the colours appear more natural and there are no shadows to create contrast problems. The clear but diffused light that often follows a shower

Clematis This flower was photographed from a distance that allowed the overall shape to be seen yet was close enough to reveal the texture of the seed heads.

Dried flower Alan Porter's series of dead flowers combines their trail beauty with different backgrounds—here, odd bits of weathered metal



Alfred Lammer



Alan Porter



of rain may be ideal for this, and at such times there is the added advantage of photographing raindrops sprinkled on a flower, giving a feeling of freshness.

Indoors there is equal scope for photographing flowers. Artificial lighting can be used very successfully, but, once again, a well diffused light suits the complex arrangement of shapes. The same abstract world of colour, interlocking curves and shadows can be explored under controlled conditions using a flower almost as if it were a colour on a palette rather than as an object.

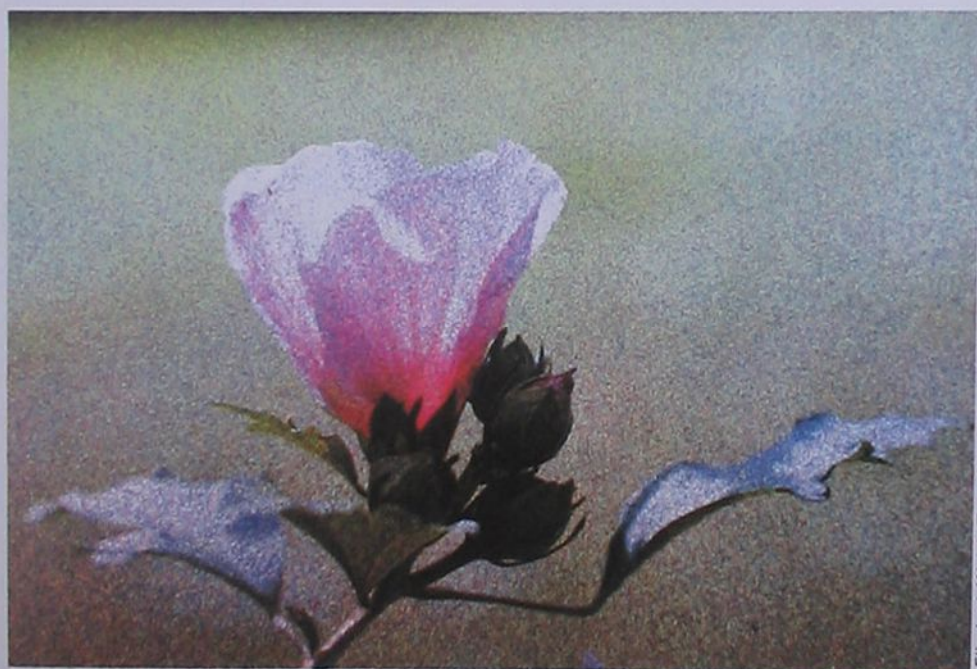
For this type of lighting, use either a sheet of translucent material (tracing paper or opal perspex, for instance) between an artificial light source and the flowers, or photograph by the light from a window on an overcast day. A skylight window is ideal. As far as the composition is concerned, flowers can be arranged as a mass, in groups, or as individual blooms. Massed shots, in which flowers and leaves fill the frame so completely that they provide their own background, can create an interesting rich pattern that gives the photograph its own texture. Arranging a smaller group of flowers against a background is basically the photographic equivalent of Ikebana—Japanese flower arrangement. The background must be chosen with care: neutral tones, such as a gently curving sheet of white paper or laminate, and those that complement the colours and textures of the flowers, such as wood or stone, are likely to be the most successful. One trick that can add sparkle and life to a flower still life is to spray the bloom with water from a plant sprayer or atomizer until the droplets coalesce and reflect the light.

If you are photographing a cut flower there is nothing to prevent you trimming the bloom to suit your purpose. A tulip with a single petal removed offers a chance to photograph the inside, using flash to backlight the remaining petals to show their full colour. Alternatively, there is plenty of scope for creating intricate arrangements of flowers to produce unusual patterns or pictures, similar to the work of Tessa Traeger (see page 1849).

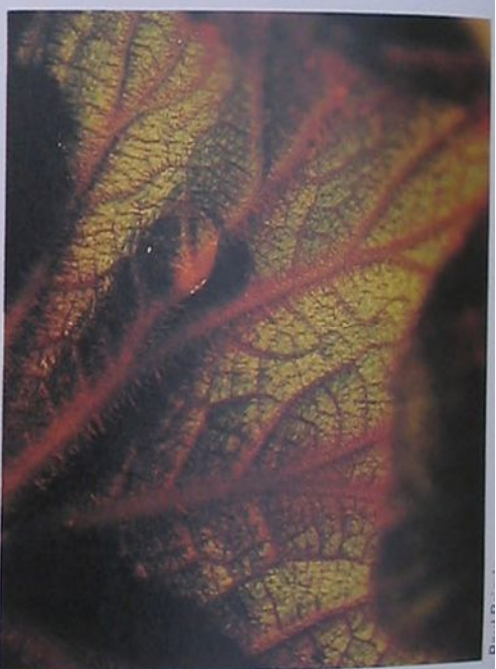
The general trend in photographing flowers is using fine grain transparency film to accurately record the colours and the fine, delicate textures. However, an alternative is to take the opposite approach to produce a grainy still life shot. The subject may be a lily placed in an attractive jug or vase. Use fast transparency film and photograph the subject from a distance so that it only occupies a small part of the frame.

Controlled lighting The artificial conditions of a studio can be ideal for flower studies. Here a dark background contrasted with the flower

Close view The power of the studio flash allowed a small aperture to be used, giving the depth of field needed to bring out the texture and soft colour



Elizabeth Welsh/Tony Stone Photo Library



The image can then be duplicated and enlarged until the subject fills the frame. The resultant build up of grain coupled with the colour shift can produce very striking results. A similar effect is achieved by using texture screens.

Photographing flowers indoors does not necessarily involve using artificial light. Window lighting can be used very effectively, as seen in the work of New York photographer Alan Porter, who photographed a whole series of images using dried flowers placed on sheets of rusty metal and other textured surfaces. Dead flowers can be exploited in this and other ways—you can experiment

with a more conceptual approach to produce unusual images featuring flowers laid on contrasting surfaces such as old wallpaper, or upon another surface—perhaps an old book.

Adopting this approach is a far cry from the point of view of a naturalist or a gardener who is more interested in perfect examples of the species photographed in peak condition. It means that there is just as much chance of finding creative potential in a dying flower lying forlornly in a leafy garden bed, than in a nursery field where large numbers of perfect tulips revive the landscape with their vibrant colour.

Rose This close-up concentrates on the texture of the petals rather than trying to show the entire flower. **Grainy effect** Most people try for extreme detail and sharpness when photographing flowers, but this shows how it can be effective to try the complete opposite. Here the photographer duplicated the original transparency sandwiched between a texture screen. **Droplet** A drop of water adds a feeling of freshness—even if it is deliberately sprayed on for the purpose. **Garlic trimmings** A 10 × 8 inch camera reveals the full textures of the dried garlic leaves and the background



Photo silk screen process

Making silkscreen printed pictures from photographically derived stencils is an interesting way of applying your darkroom work



Many darkroom processes for producing unusually coloured graphic images tend to be rather elaborate and expensive—particularly if you want to produce a large number of copies. But with the aid of a silkscreen, you can make striking graphic images very simply and make as many copies as you want for little more than the cost of some coloured inks and paper. And you can print on to virtually any surface.

Silkscreens are simply an elaborate form of stencil. The screen itself is a silk, cotton or nylon mesh stretched taut across a wooden frame, which can be home-made. The image is printed by forcing ink, with the aid of a rubber squeegee, through a stencil stuck on the screen. Different colours are achieved by printing through various stencils with appropriately coloured ink.

These stencils can be made very simply by handcutting methods, but more sophisticated results can be obtained using photographic techniques to make a *photostencil*. Photostencils are made by contact printing a high contrast lith positive on to special blue light-sensitive photostencil film. When the photostencil film is washed, the exposed areas are removed, leaving the stencil. This stencil is then stuck on to the silk screen mesh and left to dry ready for printing preparations.

The lith originals

To make a photostencil for screen printing, select a well exposed, sharp and detailed black and white original negative. You can simply print it on to lith film by contact or enlargement as described in pages 914 to 917. The image should be the right way round when looked at from the emulsion side. Both the positive and negative can be used for producing photostencils.

Alternatively, you can make lith positives from colour transparencies via a lith internegative to achieve an image that looks posterized (see page 2015). This method works best with slides which have well separated tones or strong colour contrast, and very sharp detail. Focus and size-up the image to a working size, say 250 x 200 mm. Lay a strip of lith film 250 x 25 mm on the masking easel and produce a test strip by progressively exposing the film under a masking card. Trial exposures



Portrait The original for this vivid example of silkscreen printing was a selective enlargement from a rather mundane black and white negative

Making a silkscreen frame

Commercially made frames are available in wood or metal but are relatively expensive. With simple carpentry skills you can make your own frame for the price of four lengths of 90 x 50 mm hardwood. You also need two removable pin hinges, an assortment of screws and a sheet of laminated blockboard at least 12 mm thick to use as a base. Decide on the maximum size of prints you wish to produce and add at least an extra 75 mm all round to give adequate working clearances. This should be the minimum inside measurement of your frame.

To make a quality frame, pin and glue all corner joints—halving joints are quite adequate for small size frames. Make the base the same size as the outside measurement of your frame. You can now attach the screen to the base with screws and pack the hinges with strips of hardwood 5 mm thick. Glue two similar squares of hardwood to the front underside of your frame at each end. These spacers are used to 'lift-off' the screen from the base, allowing quick release of the mesh during printing. Remove the hinge pins to separate the screen from the base whenever you need to clean the screen, re-mesh the frame or transfer a stencil to the mesh. A useful extra feature is to screw loosely a supporting leg to one side of the frame. Every time you lift the screen when printing, the leg will drop vertically and so support the screen in a raised position. Although there is no need to paint or varnish the frame, it should at least be sandpapered smooth—particularly on the lower edge of the frame across which the mesh is stretched—otherwise the screen may tear.



Mike Saunders

Mesh materials

Synthetic mesh materials have replaced natural meshes, making the name 'silkscreen' a misnomer. Nylon and polyester materials, specifically manufactured for screen printing are available from specialist suppliers. Less expensive substitutes are curtain materials which can be bought from drapery stores. For photographic stencils, select the finest plain weave.

Stretching the mesh

Frames over one metre in length should be mechanically stretched by a screen printing supplier, but smaller home-made frames can be stretched by hand. With the help of an assistant you can stretch your own mesh. You will need a heavy duty staple gun and a light hammer. Cut your mesh so that it is 50 mm larger all round than the outside measurements of the frame. Stand the frame on one end. Fold the mesh under to form a hem, laying it

along the frame while pinning the material with staples at a centre point along this edge. Turn the frame onto its other end, make a second hem and fix more staples in the opposite centre position while pulling the mesh tight. Repeat this for the other two sides of the frame. The mesh should now be tensioned in the form of a cross. Work from either side of each centre point, pulling and stapling at approximately 10 mm intervals, alternating between points on opposing sides of the frame. Complete the stretched mesh by hammering the staples fully home.

As a check, tap the mesh with your finger—it should be as taut as a drum and sound like one. For additional strength cut strips of strong cardboard to fit along the frame edges and staple this down to trap the mesh between the card and wood. Complete the screen by sealing the cardboard with waterproof tape.

Mesh preparation

All newly stretched meshes have a smooth, shiny surface which will reject the stencil until treated. To 'key' a mesh, you must roughen it by first sprinkling with water and scouring powder, then scrubbing it with a nylon brush. Follow this with a force wash to remove all excess particles. This is a once-and-for-all process which need not be repeated during the life of the mesh. A mesh which has been previously used for printing becomes greasy with ink, or fingerprints and this could reject the stencil. It can be degreased with a two per cent solution of caustic soda, scrubbing with a nylon brush. Then wash the mesh with cold water.

can be 10, 20, 30, 40, 50, 60 seconds at f/11. Move the card across the film at ten second intervals, uncovering the film approximately 40 mm for each step.

Develop the test strip in equal parts of A and B lith developer for 2½ minutes at 20°C. Fix and wash, then select three strips, one underexposed one overexposed and a mid-exposed strip. Make the final size lith negatives by exposing each one separately at the chosen time.

To make the lith positives, start with your overexposed negative, since this has the greatest area of black density. Produce a positive test strip using a masking card, this time in a large contact frame, or under glass (see page 916).

After processing this strip, select a step having good black density area—the clear open areas should have no density. Using the same exposure time as your selected test step, process each sheet of film equally and produce three finished size positives. You can make the photostencil from either these three positives or the straight lith negative.

Photo stencil material

There are three types of commercially available photographic stencils: direct emulsion, direct film and indirect film. But indirect film is by far the easiest to prepare and to remove from the mesh after printing.

Indirect film is so-called because it is processed first and then transferred to the mesh later. It is available from specialist graphic art supplies and can be handled in subdued room lighting. The film is manufactured as two layers—one is a blue sensitive emulsion and the other a clear plastic carrying sheet. Normally, the emulsion layer is soluble in water but when exposed to strong blue light it becomes insoluble. During exposure to a strong blue light source, the emulsion is rendered increasingly insoluble in water. When a film positive is placed in contact with the stencil film, the image areas are protected from the light and so remain very soluble. So when the film is washed out, the image areas are dissolved away while the exposed areas remain intact leaving behind a stencil of the image.

Making the photostencil

To expose the photostencil material you need a sheet of plate glass with smoothed edges, larger than your stencil, and a sheet of clean foam rubber mat to ensure good contact between your lith original and the stencil. For the exposing light, a 150 watt photoflood is suitable—but you could use a movie light if you have one, for shorter exposures.

Position the exposing lamp one metre above a suitable work top. Lay the foam

Equipment requirements You can make your own silkscreen frame or buy one ready-made from art supply stores. In addition to the screen, you need paper for printing, stencil film, a squeegee, mixing palette, inks, gumstrip, turps, and masking tape. A Q1 movie light or high intensity UV lamp is needed for exposing the stencil. Also needed are a foam rubber mat, a hairdryer or electric fan, and lay marks for registration. Old pieces of card, rag and newspaper should be used for cleaning the silk screen mesh after use



Tim Stephens

Making a stencil



1 Start by making a lith film positive, negative or set of separations from the original. A selective enlargement from a b & w negative was used here



2 Sandwich the lith image with a piece of photostencil film, emulsion to emulsion and weighed down by a sheet of glass. Use a QI lamp for exposure



3 Take the stencil to the sink and spray the emulsion until the image areas are completely clear. Try and maintain the water temperature at about 20°C



4 Carefully peel off the backing layer of the stencil to leave behind the stencil emulsion—and image—on the screen mesh itself



5 Carefully apply special filler, a blue coloured water soluble gum, to clear areas of the screen surrounding the picture image



6 Seal the inside edges where the mesh meets the frame with gumstrip. Add further filler as necessary, and spot out any pinholes left as the gum dries



rubber on the baseboard directly beneath the light source. Cut a piece of stencil film 50 mm larger all round than the positive image size and lay it emulsion down, on the rubber mat. Place the lith positive emulsion down on the stencil film so that the positive image is seen reversed. Lay the plate glass over the positive to complete a four part sandwich.

Now make an exposure test by progressively exposing the film under a masking card. To start with, try four steps



Flag The original image for this pair of silkscreen prints was a colour slide, from which a set of separations was produced. By printing part of this set a graphic effect is obtained (left). An alternative is to print on any suitable colour paper (inset)

at three minute intervals—but allow the lamp to cool between long exposures, if necessary.

Prepare your screen and leave the mesh damp (see panel). Take the exposed stencil and lay it on a slightly larger sheet of rigid plastic. Fix it at one edge using plastic clothes pegs. You can now take the combined sheet and film to a sink or bathtub for the wash-out stage. Spray the film with a jet of water at about 20°C and wash it until the image areas are completely cleared of coloured emulsion.

Carefully lay the washed out stencil emulsion up on a second foam rubber mat. Looking through the screen, lower the frame squarely over the stencil and gently bring the stencil and mesh into contact. Temporarily lay a sheet of newsprint over the mesh to absorb surplus water. Then leave the stencil with a warm air fan by directing the air to the inside well of the screen. When the stencil is thoroughly dry, peel away the clear plastic backing film.

Test print the stencil (see printing) and select the exposure step which gives the best print. Clean and re-



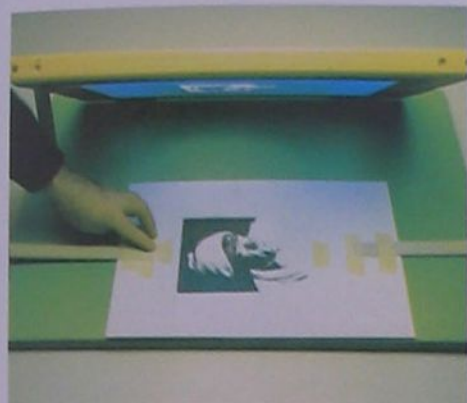
4 When all the coloured emulsion of the image has been removed, place the stencil on a foam rubber mat and gradually lower the screen into contact



5 Cut some sheets of blotting paper or other absorbent paper and lay this over the screen to dry moisture from the stencil, applying pressure



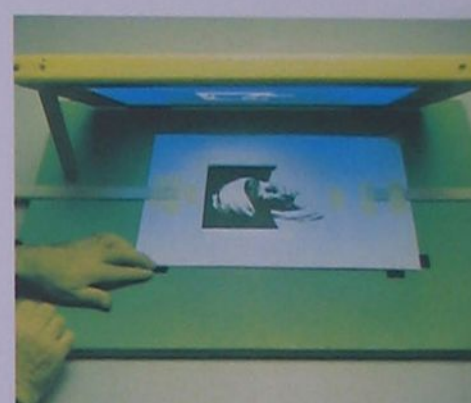
6 Use a fan—a hairdryer is particularly convenient—to dry the screen and 'fix' the stencil emulsion to the screen mesh. Complete drying before proceeding



10 Some form of print registration system is useful. One method is to tape the original lith positive to white paper and use this to position 'laymarks'



11 Carefully lower the screen and manipulate the lith image in register with the screen image using card handles fixed to the lith pos backing



12 When the image is in register, raise the screen and position self-adhesive lay marks at the corners of the paper. Make these from hardwood strip

prepare your screen. Repeat the exposing, wash-out and transfer stages to produce a finished stencil. Provided you do not change your light source or distance from the stencil emulsion, the established exposure time can remain the same for every stencil produced.

Preparation for printing

Prepare the screen by filling in areas around the stencil. Use 5 cm wide gumstrip to seal the inside edge where the mesh meets the frame. Fill in the mesh area between the gumstrip and stencil with water soluble glue or spirit shellac. Finally, check your stencil for pinholes and spot these with glue.

Printing materials

You can make screen prints on virtually any paper which is smooth and not too absorbent, using whatever colour or type of oil based ink you choose. Oil-based inks can be purchased from graphic arts suppliers—household gloss paints can be used instead provided both the paint and stencil are removed from the mesh with suitable solvent immediately after printing.

The equipment you need includes a palette knife, a flat-bladed squeegee, and a mixing palette such as an old tin lid. Empty glass jars and white spirit, or turps substitute, are needed for mixing and thinning ink. Wear rubber gloves throughout, and work in a well ventilated room to prevent a build up of fumes.

When mixing or thinning ink, make sure the ink flows thickly but freely from the palette knife. Test mix two or more colours by always adding dark colours to light, then thin the mix down.

Single screen prints

If you are printing a single image, single colour screen print, simply place a sheet of paper under the silk screen—there is no need for any form of registration. Pour a small quantity of ink along the edge at one end of the screen, clear of the actual image. Hold the squeegee firmly, pressing down hard at a 45° angle, then draw it towards you to bring the ink across the image area in one continuous motion. Raise the screen—avoiding ink drops—and stroke the ink back through the screen. Remove and check the first print. Clip it into a peg and hang up to dry.



Abstract If you are printing from stencils made from colour separations, interesting colour distortions can be made by using the 'wrong' colour inks



Printing with the silkscreen



1 Start by preparing the ink or paint medium to be used for printing. Use turps to thin down thick paint, adding it gradually



2 A blend of colours can be made in several ways—here by placing a small amount of each colour side by side at the edge of the silkscreen



3 Draw the ink across the screen, in a continuous motion. Raise the screen and stroke the ink back through the screen. Protect the base with paper



4 Having 'run up' the screen, you are ready to make prints. Put a sheet of paper in the laymarks and lower the screen on to these laymarks



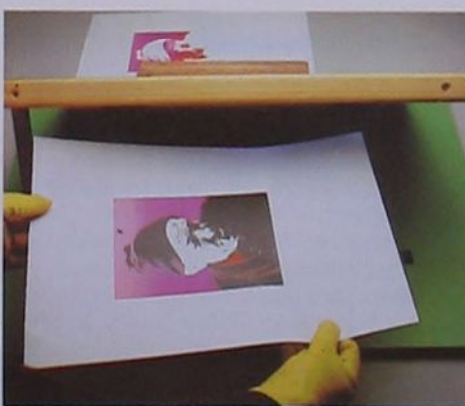
5 Hold the flat blade squeegee at 45° and draw the ink towards you, forcing the screen into contact with the paper. Lift the screen and stroke the ink back



6 Remove and check your first print. If this is successful you can print a whole batch. Let these prints dry before adding another colour



7 Scrape off excess ink using a piece of stiff card. Place newspaper beneath the screen and wash the screen clear of ink using turps and rag swabs



8 To print subsequent colours, align the part printed image with the next screen image to position the laymarks. Then continue printing as before



9 For this image, a stencil made from a negative was used for the pink and white printing. This was overprinted using a stencil made from the lith pos

Commercial inks dry in 30 minutes—some even in a few minutes—whereas household paints may take hours.

If your prints stick to the screen, thin the ink further. Screen inks dry by evaporation and ink thickening can occur on the screen during a long printing run. If sticking persists, try

increasing the physical separation, or lift-off, between the frame and paper provided by hardwood *laymarks* or separators (see panel).

You can prevent prints sticking at the corners by spraying the print base with low-tack spray-mount adhesive—this keeps your sheets flat.

Providing the screen does not get clogged up during a run, you can run off as many prints as you like in one session—one of the significant advantages of this process. Simply repeat the squeegeeing action each time, adding ink at the screen edge as it gets used up. At the end of the print run, scrape off any



Xmas card A 35 mm colour slide was used to make a posterization in three colours. The scene is mainly 'cold', and so blue colours were printed to give the right 'feel' to this greetings card. Windows Lith tone separations formed the basis of this abstract

unused ink that remains with stiff card.

Then clean the stencil carefully—you will find this easier with the frame raised on end and braced against your body. Soak a paper towel or cloth rag in spirit or turps and rub both sides to clean the screen. Alternatively, place blotting paper or newsprint beneath the closed frame and force ink residues out with a spirit-soaked cloth.

The stencil itself can be removed by placing the frame and screen in a bath of tepid water. Any residue can be removed with bleach or domestic cleaner. Finally, degrease the mesh with a two per cent caustic solution to prepare it for the next colour or image stencil.

Multicolour registration

You have to make a separate photo-stencil for each separate colour, or image, you wish to print. One of the problems of printing a sequence of different stencils is registering subsequent images, unless a random montage is acceptable. To ensure that successive images register correctly, you need a system which feeds each sheet in to the same position every time a colour is printed. This can be achieved by arranging the frame and baseboard separation strips or laymarks to act as stops for the end and two sides of the paper—simply make sure that the paper is pushed properly home against these.

While this ensures that the paper

remains correctly registered to the frame throughout printing operations, it does not guarantee that the stencil image will do so.

To get round this, reposition the printed image in register with the screen image next in line to be printed. On each occasion, carefully tape the part printed image to the baseboard once the two images have been correctly registered, then print the overlying screen. Let the print dry, then register it with the next colour to be printed, adjusting laymark the fixing tapes as necessary.

If you are running off a large number of prints, the laymark system for quick registration of each print can save much valuable time.

During printing, each colour must be allowed to dry before another is registered and applied. Poorly registered images will result in an interesting bas-relief effect.

Ideally, choose related but physically separate components when making up a silk screen image composed of different images and colours. Always start with the background image first, working 'forwards' to areas of greater interest. Overprinting a dark colour by a light one may or may not influence the colour of the lighter one, depending on the type of ink you use. Also, you will have to try out whether or not colour 'mixture' is obtained by overpainting one colour by another, though this is unlikely.





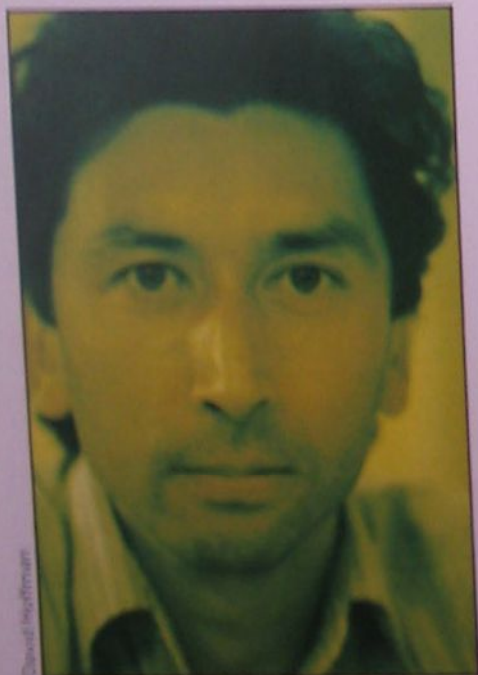
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Chris Steele-Perkins: Magnum

Chris Steele-Perkins

A keen eye and a strong sense of social awareness have combined to make Chris Steele-Perkins one of Britain's leading photojournalists



David Hoffmann

During a lull in the civil war in El Salvador in early 1981, photojournalist Chris Steele-Perkins felt he needed a break from his constant problems with the military. He decided to travel to neighbouring Guatemala for a couple of weeks. Other photographers might have occupied their break by lazing on a beach. But instead he spent his time taking photographs of the events taking place to celebrate Holy Week.

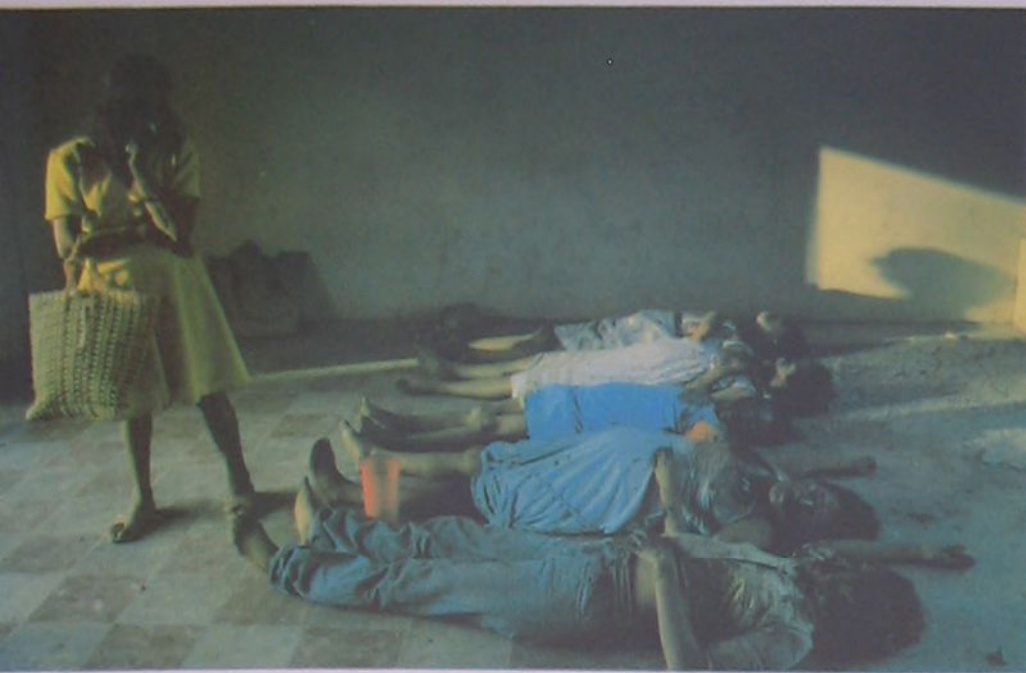
'I find it difficult to be somewhere that I find interesting and not take photographs,' he says. 'I don't really have holidays in the way most people do. I get bored with just sitting on a beach.' In the same way Chris Steele-Perkins would get bored with just taking pretty pictures. Often, he does his best work when politically and personally involved in the situation he is covering. This is why he was covering the war in El Salvador and also why most of his subjects have been social or political issues.

Politics and photography have blended very well in Steele-Perkins' life. In following his personal interests through his photography he has developed a highly individual style. He manages to take pictures that produce an immediate emotional response in an age when documentary and war photography has become an art.

Steele-Perkins' subject matter has been socially orientated ever since he launched his career as a professional photographer covering the relief work of the *Save the Children Fund* in Bangladesh. Since then he has worked on projects as diverse as the civil wars in Central America and the problems of inner-city life in Britain.

However it was while he was a student at Newcastle University in 1968 that

Shop window The up-market shops of San Salvador are a bizarre contrast to the realities of city life



El Salvador, 1981 A woman searches for missing relatives among the victims of right-wing death squads

Steele-Perkins first became seriously interested in photography and began working for the university newspaper. This later helped him to get his first paid work—taking 'front of house' pictures for the theatre and portraits of the actors. It was very useful training but he soon realized that he had little interest in theatrical photography and started to look in other directions.

After a holiday in Morocco he sold some of his pictures to the *British Journal*

of *Photography* and made contacts at the *Times Educational Supplement* and other similar publications. 'I used to commute down to London, ring a few people and just ask if there was any work. I had a fairly tatty box of prints and I'd just phone up and go along.

'All the work came from London and it became fairly obvious that I would have to move. So I did, and started freelancing in earnest. I had a few contacts I could ring, I kept up some theatre work and I

did portraits for *The Listener* (a BBC publication about broadcasting and the arts) and odd things that I picked up.

'I'd hate to start off that way now. Although some people were very helpful, I also got ripped off. I did some stuff for *Vogue* who paid me £10 and said how pleased I ought to be to have a shot in their magazine. But it was enough. I was living very cheaply and I could survive on what I was getting.'

Watching television one evening in 1973 Steele-Perkins happened to see Bishop Biswas of Calcutta talking about the relief work in Bangladesh. 'It was about a year after the war and I felt that there must be a lot going on out there. So I thought I'd go out and see. I didn't take it too seriously, I just got some addresses from the charities, packed a bag and went. In the end I stayed with *Save the Children* nearly all the time. They looked after me and gave me excellent access to the clinics and the relief projects. I gave them some pictures that they are still using now. I didn't work too hard at it. I shot about 100 rolls of black and white and perhaps four of colour. It was as much a chance to go to India and get bombed out of my mind as anything. It was what people were doing at that

Bangladesh, 1973 The wan, curious faces of these peasants have been caught in a surreal half-light





The Teds, 1978 Taken for a long-term project on a group which maintains the dress and style of 1950s teddy boys

time. I just can't afford to do that any more. My attitude to work has changed a lot since then. You need to experience the foreign culture and you can't do it by hanging out with stoned hippies in India.'

Foreign trips are still central to Steele-Perkins' life. In late 1981, for instance, he spent three months in South Africa photographing various aspects of life in South Africa. On assignments like these, he likes plenty of time to explore the subject in depth and it is quite usual for him to go back again and again until he feels he has the thorough range of coverage he wants.

His expeditions are always planned in great detail and carefully researched in advance. 'Contacts are tremendously important. You talk to people who have been to the country you're visiting and try and get addresses, names of people to see, places to stay. If you are trying to do a story that is political and under

difficult conditions like the one in El Salvador, it is essential to have people who can fill you in on events and let you know what is happening.'

In a situation as dangerous as El Salvador, where waking up to find a headless body in the street is hardly even a surprise, working as a photo-journalist calls for more than the ability to just get your exposures right. 'There are a number of photographers there. Most are serious professionals, but there are always some cowboys who just like running around in a war zone with a camera. So to get pictures that are a cut above the rest, some risks may be necessary.'

Not that Steele-Perkins is averse to taking considered risks. He wanted to include material on the guerrillas as well as the more often-seen coverage of the army and tried unsuccessfully to make contact four times. 'Finally we just walked out of town in the direction we knew they were. We got a little way out and met some young guys with guns just standing by the side of the road. They

took us to the camp but in the end we couldn't get permission to photograph and so it came to nothing.

'There was a degree of risk but probably more from the military. I felt much safer with the guerrillas than with the army. The military were the ones who were committing the atrocities which is what makes it so abhorrent for Reagan to support their regime.'

Although commercial pressures mean that he shoots much more colour than black and white he still prefers black and white. 'There is something purer and more austere about black and white. You leave more out. You can go straight for the content and meaning with black and white. One of the problems with colour is that it can get into just being about colour when you want it to be about the subject.'

Although his style is very individual he has been involved with various groups of photographers from very early on in his career. In the mid 70s a French group called *Viva* came over to England looking for photographers. In the end both Homer Sykes and myself became



Ulster family, 1979 Overcrowding at the home of a Catholic family on the Turf Lodge Estate in West Belfast.

'Tongue-tied' Danny's wedding, 1978 Danny was the Teds' discjockey and a familiar figure at their gatherings

involved—it was very good.

The central idea of *Viva* was that it should allow photographers to make a living doing their own thing. In a sense it was too idealistic. There wasn't enough of a market for that kind of personal photography. Looking back I regret not taking the agency more seriously and becoming more involved early on but I was very involved then with England and with English things.

In 1979 Chris Steele-Perkins became involved in the *Magnum* agency who asked him to become one of their photographers. The support and freedom they offer suits him very well. "There is always pressure to earn money in *Magnum* but the distribution they give me does mean that I can follow up the stories I choose and still survive





commercially. They put out and sell stuff in a way that I couldn't individually and I find the range of different photographers inside *Magnum* stimulating too.'

Apart from the value of working in an organisation that includes some of the world's best photographers, *Magnum* also offers basic practical support for a photographer working far from home. 'It is very useful to have a place to send film back to. You can ask if it is coming out all right and it is good just to have someone to contact, to pass information through.'

Chris Steele-Perkins is not an equipment fanatic and likes to be mobile when working abroad. Apart from two or three Canon bodies and lenses from 24 mm to 200 mm he will usually take a lightmeter, a couple of small flashguns and perhaps a lightweight tripod together with a good supply of Tri-X and Kodachrome 64 film. The non-photographic items are every bit as important, a tiny short wave radio means that he stays in touch with local and foreign news. He will also take a camper's knife, money belt, credit





Chris Steele-Perkins/Magnum

Somali camel herders, 1980 Shown on the long trek through the Ogaden to find fresh grazing for their herds
Hopping's Fair, 1970 Outside a small wrestling booth in a traditional fair held every year at Newcastle-on-Tyne

cards, a notebook, waterproof felt tipped pens for marking films, cuttings and local information, water tablets and first aid supplies. He also carries a good supply of spare batteries and never travels anywhere without a set of camera screwdrivers. All this fits into a single travelling bag and the small shoulder bag he carries around with him.

While Steele-Perkins is happy to work on long term stories for magazine and newspaper sales he feels that a more permanent form of work is necessary to make a really clear photographic

statement. 'Stories are things in themselves just as individual photographs are things in themselves but a book is the most difficult and the most satisfying product. Photographic books usually have only a small circulation but in terms of setting out most clearly what you want to say then, for me, the book is the ideal vehicle.'

Steele-Perkins has produced two books. *About Seventy Photographs* is a compilation of recent British photographs and was put together with the help of another photographer, Bill Messer, with aid from the Arts Council. The other book, *The Teds*—about the 'teddy boy' sub-culture throughout Britain—contains his own photographs with a text written by Richard Smith, a journalist.

He believes that the strength of

documentary photography lies in bringing together the situation and the photographer, when the photographer's approach to a subject is all-important. But he is also very aware that this process can sometimes alter situations.

'One picture that *Save the Children* used a lot is of a little kid crying in a refugee camp. What you don't see is that the only reason he is crying is that I was taking his picture and that scared him!'

'In the end you are always obtrusive if you intervene in a situation. You may ask someone to move or ask for permission to take their portrait. You have to interact with the situation to get on to the film the way that you experience it.'

For Chris Steele-Perkins, photography always comes back to the politically personal. 'What I am doing is looking for subjects that are open for me to put myself into. When you've taken a fine photograph then I think you've seen something that is very particular to you. It comes both from your seeing and from the situation that you've chosen to put yourself into. Just for one moment you and your subject are integrated.'

'There is an infinite choice of things to photograph—you must choose which face of the Rubik cube of life you are going to put together. What is important to me about photography is not that I make vast amounts of money but that through it I can pursue my own interests in the world.'

Soldiers at ease For these young men, the army provides one of the few secure sources of income in El Salvador.

Refugee mother and child Two Somali victims of war and drought in the disputed Ogaden region of Ethiopia



Colour filters

From correction and contrast filters for b & w films to light balancing and conversion filters for colour films, filters have an enormous variety of photographic uses. But just how do they work?

Unlike the human eye, the colour response of a film cannot change to suit the lighting conditions (see page 1314) and so in many situations some colours will inevitably be recorded inaccurately. However, coloured filters can be used to 'change' the lighting conditions to suit the colour response of the film, either as the picture is being taken or during reproduction. Coloured filters are used in black and white photography in the same way to control the tones of grey in which various colours are rendered.

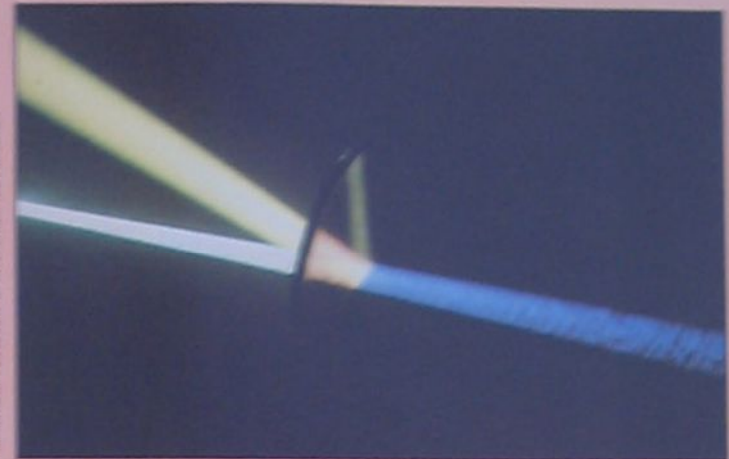
Coloured filters take many different forms and can be used to change the colour of the light at many points in the photographic process.

Yet despite the wide variety of uses and classifications, coloured filters are all essentially the same, they are simply sheets of transparent material coloured with appropriate dyes to let through some colours of light while absorbing others. And they all work in much the same way.

Absorption

When light falls upon any surface, some is absorbed, some passes through and the rest is reflected. The relative proportions of absorption, transmission and reflection depend upon the material. Obviously, all transparent materials transmit a relatively high proportion—though even the clearest glass in a camera lens absorbs and reflects some light (without multi-coating the reflection would be even higher). Opaque materials transmit none. Coloured filters transmit certain wavelengths (colours) of light while absorbing others.

The selective absorption and transmission of various wavelengths of light depends upon the molecular structure of the dyes included to colour the filters. Even clear glass absorbs light selectively—



Light split Dichroic filters transmit some colours and reflect the rest. Here, white light entering from the left splits into blue (transmitted) and yellow (reflected)

ultraviolet light is absorbed more than any other colour—but each of the dyes used to colour filters has a chemical structure that 'fit' only certain wavelengths of light. Wavelengths that 'fit' the chemical structure are absorbed. Wavelengths that

do not fit are either reflected or transmitted. By altering the chemical structure of the dye, filter manufacturers can decide which wavelengths are absorbed and which transmitted.

Of course, the light energy absorbed in the chemical

structure of the dye does not simply disappear: some is re-emitted as invisible infrared light, some is dissipated as heat—though in quantities so minute that you cannot normally feel it.

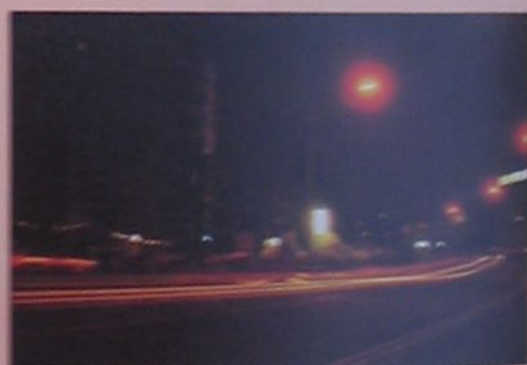
Filter colours

When you look through a filter, the only light that you can see is wavelengths not absorbed by the dye. It is these wavelengths that give the filter its colour. When you look at a yellow filter, you are simply seeing white light with the blue content taken out. The yellow is simply a mixture of the red and green light remaining.

So strictly speaking, the term 'yellow filter' is a misnomer: it filters out blue light, not yellow. However, it is convention to name a filter by the colour we see when it is viewed against white light. So a filter that subtracts green light, for instance, is known as a magenta filter—its magenta



Special filter A didymium glass filter absorbs a narrow band of yellow light only (lower spectrum). The top spectrum is unfiltered



Streetlights The top view, with no filter, shows sodium, fluorescent and tungsten lamps. The lower view, with didymium, lacks yellow sodium only

Michael Newton © Marshall Cavendish

Michael Newton © Marshall Cavendish

Robin Seagull

colour is simply a mixture of the red and blue light remaining after the green has been subtracted.

There are exceptions, of course, but these apply mainly to filters that have no visible colour. Ultraviolet filters, for instance, are colourless but actually filter out ultraviolet light. Infrared filters, on the other hand, are virtually opaque to the eye, and filter out nearly all light but infrared. Although they are less commonly used, it is also possible to obtain filters that transmit only ultraviolet light and filters that absorb only infrared light. These filters are opaque and colourless respectively.

Absorption curves

The effect of a filter varies with the density of the dye colouring. Where the dye is very dark, most light of the right wavelengths to be absorbed is trapped by the molecular net; where the dye is dilute, most is transmitted. Because a filter absorbs more light, it appears darker—it also appears more saturated because less of the absorption wavelengths get through to tip the balance of the light towards white. So strongly coloured filters always have the most effect, weakly coloured filters always have least effect.

The strength of a filter can be measured in terms of the percentage of the particular wavelength it transmits or the percentage it absorbs—if you see a figure for absorption, you simply need to subtract the figure from 100 to give the transmission, and vice versa.

Ideally, every filter would absorb the desired wavelengths to the right extent and no more: other wavelengths would be transmitted completely. Unfortunately, this is impossible in practice. A filter designed to absorb 80 per cent of the blue light at a wavelength of 450 nm, also absorbs perhaps 40 per cent of the light at 500 nm, 20 per cent at 550 nm and even absorbs some light at the far end of the spectrum at 700 nm (red light).

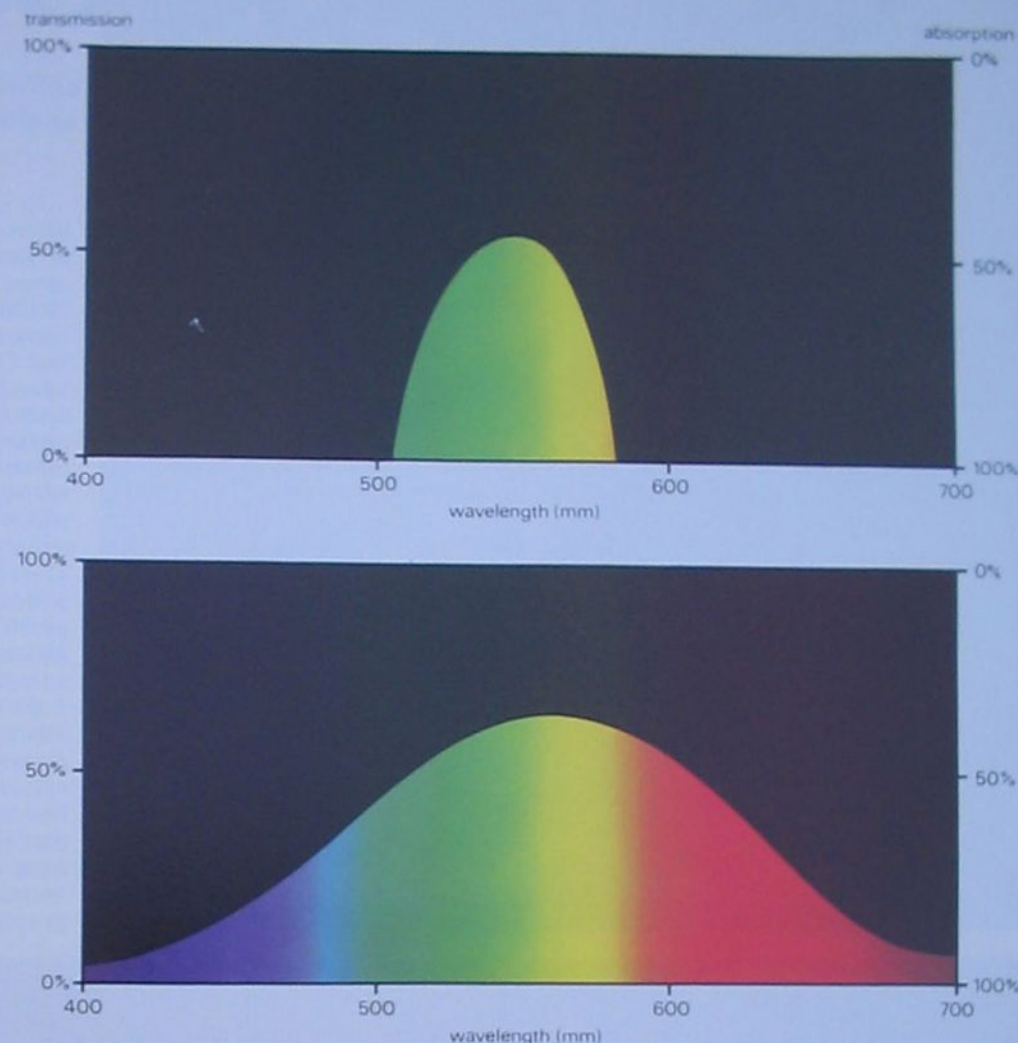
The absorption of different wavelengths by any filter can be measured with the aid of a photospectrometer and plotted on a graph as an absorption curve. The curve clearly shows the dominant

colour of the filter where the curve dips—that is, the wavelengths for which absorption is least.

Since the relationship between absorption and transmission is direct, the transmission figures can be given (in reverse) on the same graph. Indeed, it is common to show percentage absorption up the left hand side of the graph and percentage transmission down the right hand side.

In this form, it is very easy to compare the absorption and transmission characteristics of a filter with the spectral sensitivity of a film. Providing the scale for the film sensitivity is suitable, the filter absorption curve can be simply laid over the film's spectral sensitivity curve (see, for example, page 1970) to make a comparison. It is then easy to assess whether the filter does the job required.

Absorption and transmission curves



Curves Typical absorption curves for a yellow-green correction filter (upper) and a 'narrow cut' green contrast filter (lower) for panchromatic b & w film

This is particularly useful, for instance, when trying to find a suitable filter for a safelight. Providing the spectral transmission curve of the filter does not overlap the spectral sensitivity curve of the emulsion, a light covered by a filter of this colour will only give light to which the emulsion is insensitive—it is a safe light. A deep red filter, for instance, which only transmits light with a wavelength longer than 640 nm, is a safelight for orthochromatic emulsions such as black and white printing paper.

Filter curves also show whether the filter is broad band or narrow cut. A broad band filter transmits light

over a wide part of the spectrum. Filters for printing are generally of this type. Narrow cut filters show a very steep slope and absorb just a narrow range of wavelengths. Narrow cut filters control contrast in b & w—a red makes green come out white and blue-green almost black.

It is important to remember that filters can never add light—they can only take it away. So although they are very useful for shifting the colour balance in a particular direction, they can only suppress colours, not enhance them. Using a filter, therefore, reduces the amount of light available and acts more like a bandage, covering the problem rather than curing it. If you can, therefore, it is better to correct the problem at source—shooting on the right film for the light and in the right conditions.

Quayside café

Amid the bustling scenes in and around a quayside café—restaurant, can be found a sequence of shots which links the seafood catch to the diners' tables



Trevor Wood

When the conversation turns to holidays in France, the topic of food invariably crops up. The gastronomic associations of this country are second only to the reputation of its wines, so when we heard that Trevor Wood was visiting France we asked him to photograph two assignments—one featuring a vineyard (see page 1701), the other concentrating on a restaurant. Since both of these involved research into the final product, Trevor was delighted to oblige and chose for his subject a quayside restaurant in Marseille called 'La Calanque' which specialized in seafood. He contacted the proprietors several days beforehand and arranged to visit their premises on one of their quieter days.

Before arriving at the quay, Trevor had already decided upon the sort of coverage he was going to give the assignment. The first thing he did was to find out where the fish were landed so that he could trace part of their route from the sea to the dining table. Having found the landing point, Trevor photographed the fish being sorted and



Sorting the fish

To include the fish, the man and the fishing boats all in one shot, Trevor fitted a 21 mm lens to his Olympus OM-2 body. The catch. A 50 mm standard lens filled the frame with the silvery catch. Trevor re-arranged the fish to form attractive, graphic shapes. **Window display** (above right) To bring out all the details Trevor used a 21 mm lens, at f/8. The slow film, Ektachrome 64, meant that a tripod had to be used to support the camera at slower shutter speed. The camera was set on its manual mode for all these shots.

included a glimpse of the fishing boats in the background. From here Trevor decided to feature the restaurant window display for his next shot, as well as taking a portrait of the owners standing inside holding samples of their food. The last two shots followed naturally in this profession—a customer enjoying his meal, and the inevitable conclusion to a good meal out—coffee, cigarettes and the bill.

This set of photographs illustrates well the way a theme can be exploited to produce several images that relate to the main topic. Trevor knew that he could not just photograph the interior of the restaurant alone and looked for a way to portray several varied aspects of the main theme. Rather than just trying to feature the food itself, Trevor also tried to convey the atmosphere of the place and the general way of life of the region.

In many of his shots Trevor tried to arrange his subject matter to produce a strong graphic effect. Whether it was the fish lying in the box or the cigarettes and coffee on the table, Trevor felt that the shapes they made were as important as the objects themselves. As he pointed out, 'Sometimes I find it is best to try and forget what the thing itself is and instead concentrate on the shape it forms in the viewfinder. This encourages a strong graphic image which has impact independent of colour, and the nature of the subject.' By adopting this technique it is easy to avoid becoming too pre-occupied with the subject's colour or its wider associations.



The proprietors For a portrait, Trevor asked the owners of the café to stand outside with some food prepared for the day. Since he was using available light the camera had to be mounted on a tripod—this meant asking the local police for permission since it is illegal to use a tripod on the pavement in France. **Customer** This customer was sitting next to an open window, so Trevor took his shots from outside. **Coffee and cigarette** These were arranged to create a pleasing design





Equipment file

Movie lights

Many home-made movies taken indoors are spoilt by inadequate lighting. But even simple movie lighting equipment can radically improve any amateur film

As with still photography, extra lighting is usually needed if you want to shoot movies indoors. The most common form of lighting for still pictures is flash, but this is completely unsuitable for movie work. Movie lights must stay very bright for a long period of time, and this has to be taken into account in their design and construction.

The professional movie maker has a wide range of lighting equipment from which to choose, but much of it is so expensive as to be beyond the budget of most amateurs. The constant transportation, assembly and dismantling of the equipment means that only the most robust construction will do, and this, inevitably, proves expensive.

For the amateur budget, the choice of lighting equipment for movie making is increasing as the use of video becomes more widespread, since the same units apply to both. As with any form of photography, the more equipment you have, the wider will be your scope, but many good movies have been made with

a wisely chosen combination of two or three basic lighting units. The best way to start is to get to know a small kit until you are familiar with its scope, then you can expand as you realize its limitations. In any event, the type of lighting you choose depends on the conditions of shooting.

For indoor work, mains power is readily available, so bulb ratings can be high to give high levels of illumination. And with the efficiency of quartz bulbs, you can buy indoor lights for almost any filming conditions. Lights are available in a wide range of ratings but, usually, they consist of a 1000 watt quartz bulb in a well ventilated housing with a reflector. They are lightweight, so they can be hand-held. A simple light with bulb costs little more than a couple of sound movie cartridges but this simple type is prone to overheating. In fact, they should not be left on for more than about three to five minutes at a time. Fortunately, this is not usually a problem for amateur work, because a Super 8 film is

only about 3½ minutes long. In any event, even a feature-length film would be made up of hundreds of short sequences.

The problem of overheating is overcome in more expensive quartz lights. These have a built-in cooling fan, enabling the light to be left on continuously without overheating. They cost about four times as much as the basic unit but the improvement in performance is worth having. Some units have two 1000 watt quartz bulbs in the same housing but instead of the light output being doubled, these give only about one half as much again. Such intensities are desirable, particularly if you wish to light a large interior, but even a large amount of light goes a surprisingly small way in a big hall.

Twin-bulb lights are not directional; instead, they flood an area with light, and so are no use as spotlights, which need some sort of lens system. Nevertheless, the area they light can be controlled to a limited extent by the use of *barn doors* (hinged metal flaps attached to the front

An amateur set-up This type of lighting is designed for still photography but can be used for movies

of the light), which can be angled to reduce the area flooded. The barn doors usually supplied with quartz lights are too small to afford much control, but you can improve their efficiency by clipping larger metal sheets on to them. But however successful your modification, you should consider these lights essentially as floodlights.

Quartz bulbs are also ideal for spotlights which range in power from small, 75 watt units to the prohibitively expensive 5000 watt units that only professionals can afford. The focusing mechanism makes spotlights much more complicated and expensive than the floodlights. Smaller units have a simple Fresnel lens system, but more powerful ones have a *condenser* (a lens that focuses light from the bulb into a parallel beam) and a focusing lens.

On some spotlights, the size of the light spot can be varied by a screw mechanism, whereas on others it is achieved by a lever; both these actions vary the distance between the bulb and focusing lens. When you adjust high-power lights—whether they are spotlights or floodlights—be sure to stand at arm's length and to one side, to avoid the risk of being showered by bits of quartz if the bulb shatters. Professional lights have a transparent screen in front to protect

On camera Portable movie lights can be attached to the camera but this method gives rather flat lighting

actors from shattering bulbs.

Another continuous light source for interior are *photo-flood* lamps. In appearance, these are identical to domestic light bulbs, and are not much more expensive, but they differ in two important ways: photo-floods are brighter, and they are colour corrected for 3400 K. They are available as bayonet or screw fitting in ratings of 275 to 500 watts. The additional brightness is achieved because the bulbs are over-run—a feature of the design—but this reduces their life to only 2 to 4 hours.

The main advantage of photo-floods is that they can be used in domestic electrical circuits as replacements for ordinary light bulbs, and they provide a natural lighting arrangement with sufficient light for filming in a small to medium-sized room. When using photo-floods in this way, you should remember that many domestic light fittings are rated for only 60 watts, so do not run photo-floods for extended periods if the wiring is in poor condition. This, though, should not be a problem with modern wiring systems.

Accessories

Only a few accessories are necessary to give good results with movie lights. Some are common to lighting equipment

for still photography (see pages 238 to 241), and others can be improvised at a fraction of the cost of commercial units. Most essential are stands, which should be sturdy, lightweight and versatile. Unfortunately, good stands are expensive because the lightweight alloys used in them are themselves expensive and difficult to engineer. But it is still possible to buy reasonably priced stands. Ideally, you should choose one that can be extended to at least 2 m in height. If a cheap stand meets your

Quartz lights The efficiency of quartz-iodine lamps makes a high light output possible from small, hand-held units. Fan-cooled models (right) are more expensive but they allow continuous use for extended periods



Lights courtesy of Professional Cameras



photographs by Jason Shenai/Lights courtesy of Photopia Ltd.

requirements but is not sufficiently stable, you could consider taping it to a stable object or structure, or weighting its legs—with sand bags, for example. The added precaution is well worth it to avoid the risk of dropping expensive quartz lights.

Where the use of a stand would interfere with the scene, or where you wish to place a light in an awkward position, an *alligator clamp* can be a useful device. It can be clamped on to a lightweight quartz lamp, for example, and screwed securely to a pipe or other suitable object.

A photographic umbrella, too, is a useful aid—you may already have one for still photography. The highly reflective surface on its inside bounces light from a harsh source into a wide-spread, diffused beam.

One item that is not readily available in the shops is a *snoot*. This is a long metal tube which fits on the front of a light to produce a narrow, concentrated beam. You can rivet two large tin cans painted matt black on the inside and achieve the same result. And a *French flag* is even more easily improvised, although you can buy one expensively in most photographic shops. This is simply

tungsten light. If the room is predominantly daylight but you need extra light, then you can place a blue filter on your quartz light so that it matches the daylight.

If you film with Super 8 equipment, there is a choice of two basic film stocks: 40 ASA (ISO) and 160 ASA. The slower of these is a fine grain film requiring fairly high light levels to give good overall exposure, whereas the 160 ASA stock is

noticeably grainier but is much more sensitive to low light levels. Both films, however, can be used in artificial light. The amount of light needed with each can be determined by metering, but your results depend largely on experience and experiment.

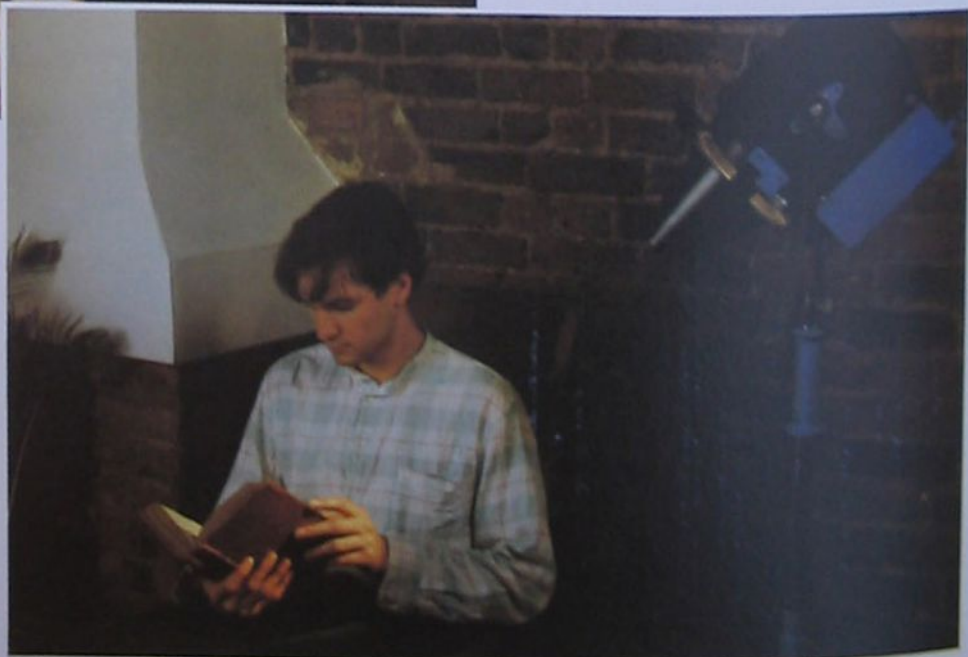
A typical scene that might be filmed indoors on 40 ASA film is a group of people in a room measuring about 4 m x 4.5 m. If you wish the subjects to move



Barn doors on this professional unit allow the illuminated area to be changed. Some amateur units have them, but you can make your own

Narrow angle By moving the barn doors inwards, you can produce a narrower beam of light, keeping the surroundings in near darkness

On the spot This unit also has a snoot to produce a diffuse spot of light. This is useful for highlighting subjects within the general scene



a matt black sheet of metal or plywood used to block out light or stop reflections entering the camera lens. With a minimum of skill, you can make one or two of these to any shape of your preference. Simplest of all the equipment you might make for yourself is a *scrim*. Basically, this is dense wire netting placed over the light to reduce its intensity without altering its properties.

Filters can give interesting colour effects but more usually they are used when you film in a mixture of daylight and tungsten light, and wish to balance for one or the other. If you use tungsten light in a room with one window, for example, you can place orange filters over the window to match the daylight with the



about freely without casting large shadows, you could use a four-light set-up together with a few photofloods to fill in and give a natural look. Four 1000 watt quartz lights placed as high as possible on stands and pointing downwards should give a fairly flat, even lighting at an aperture of about $f/2.8$.

The faster film, on the other hand, is intended for existing light or XL photography. A normal condition for this would be a medium-sized room lit by two 100 watt domestic light bulbs. These would be acceptable for filming but the camera lens would need to be opened fully to about $f/1.2$, which is a difficult aperture for focusing. A better result could be obtained by replacing the bulbs with two 500 watt photofloods, giving as much as four to five times more light, with an aperture of about $f/5.6$ and more natural colours.

Outdoor lighting

Most amateurs do not use lighting outdoors, though professional film companies will use some lighting even on bright days. Lighting exteriors for movie making can be a mammoth task, requiring large capacity batteries or electricity generators—all outside the scope of the amateur. But simple set-ups can improve the look of your outdoor shots. A piece of aluminium foil or white paper, will reflect sunlight on to the face

Unwanted reflections can be avoided with a French flag, used to shield the camera lens

of your subject to balance out harsh shadows and improve quality.

To light close subjects outdoors on dull days, a *sun gun* is a convenient unit. It is portable, compact and can be mounted on the camera to provide sufficient light to film by within a range of 1.5 to 3 m. Power is supplied from a small battery pack, which can be recharged at the mains, making this type of unit usable both outdoors and indoors. At the heart of the sun gun is a comparatively small quartz bulb, which might be between 150 and 350 watts, with a colour

Greater scope A professional set-up, suitable for lighting 16 mm movie sets, may include this range of lights

temperature of 3200 K.

Quartz bulbs are commonly used in movie lighting, because they are small and extremely efficient. They comprise a tungsten filament in a quartz (instead of the usual glass) envelope filled with iodine gas. For this reason, quartz lights are also known as tungsten-halogen or quartz-iodine lamps.

The quartz bulbs in a sun gun should be switched on a few seconds before filming, to allow full brightness to develop. A fully charged battery pack will give satisfactory brightness for only about 10 to 15 minutes, but this is usually sufficient for most amateur sessions. A drawback with sun guns is that because they are light in weight they tend to be used only on the camera, resulting in flat lighting. The power drop off can lead to exposure problems, particularly in high contrast scenes. A subject's white shirt, for example, will reflect strongly and cause the exposure meter to give a reading for which the rest of the scene, such as the walls of even a small room, is underexposed. This can be overcome by taking readings on the less bright areas of the scene, or by zooming in on a person's face for a reading. At about the cost of an average sound movie camera, a sun gun can be a major investment, especially if it is likely to be used only occasionally. However, the look of your movies could be considerably improved.



Camera courtesy of Sight & Sound; lights courtesy of Ballamcroft Ltd

Improve your technique

Pictures from aircraft

Aerial shots often make unusual and exciting images, but to get good pictures from the air you need access to a light aircraft and the ability to think and work quickly in a difficult environment



Most people travel in an aircraft at some time or other. And for the photographer, flying presents an exciting opportunity for unusual landscape shots. Apart from its practical value as a tool for commercial surveys, such as archaeology, geology, map making and crop analysis, aerial photography is ideal for dramatic, panoramic views.

Taking pictures from planes, helicopters and gliders is relatively straightforward and no special equipment is needed. The results are affected more by the type of aircraft used, and so some of the most important considerations relate to the aircraft and the flying rather than the photography. So these should be thought about before you begin. The photographic techniques which are covered here apply to all types of suitable aircraft.

Aerial photography is a wide term. It includes pictures taken from flying machines ranging from gliders to jetliners. Although it is sometimes possible to take interesting shots through the window of a jet, this approach is very limited. So this article is mainly concerned with shooting from light aircraft.

These are expensive to hire, but you

Cloudscape Even if the ground is not visible, you can often take pictures of impressive cloud formations

may be able to find a friend or acquaintance—perhaps a weekend flyer—who is willing to take you along. Alternatively, the professional members of a local flying club or training school are often a convenient source of

reasonably cheap flights.

If you are undertaking commissioned photography the operator of the aircraft must hold an Air Operator's Certificate and employ professional pilots, so in this case you can be sure of getting a skilled person.

Plane and pilot

Should you be able to choose a plane, a single-engine, high wing plane, such as a Cessna 152 or 172, is often best. It is worth checking the view from the seats before you fly. High wing aircraft have struts which may get in the way. You should also check whether there is an opening window adjacent to your seat as pictures taken through glass are inevitably of lower quality than those shot through open windows.

If you have a choice of pilot, choose someone with a fair amount of experience. Bear in mind that it is necessary to complete only 40 hours of instruction before qualifying as a private pilot. And although a newly qualified pilot is competent, he or she will probably not have the skill at positioning the aircraft required by the photographer. An experienced pilot—one with a few hundred flying hours in the log book—will help you to get the most from your limited flying time.

At the airfield brief your pilot as to how you would like the aircraft positioned. The more he knows before you set off, the more use you can make of airborne time. While in the air he is likely to wear a headset for communication. But you will find a headset a nuisance in addition to camera straps. However, you can often communicate verbally because usually only one of the pilot's ears is covered by the headset. If this is not so, agree hand signs for 'up', 'down', 'closer', 'further', 'lets go home!' and so on.

Always make sure you are properly dressed for the flight. With a window open in flight the outside air temperature is cooler by 2 degrees C for every 300 m of altitude than on the ground. This does not mean dressing for an arctic winter but it does mean wearing a warm anorak and light touch-sensitive gloves unless the weather is hot. If you are prone to

Which film? We flew over London aboard Capital Radio's 'Flying Eye' traffic plane to find out. From left to right: Kodachrome 64 is sharp but was affected by haze; B & W infrared film is little better; but false colour IR film gave the clearest results, and produced some very graphic images



Shaun Kelly/Tony Stone Photo Library



Reflections Shooting through a plastic window using a polarizing filter produced these rainbows on water

visibility results are bound to be disappointing. A knowledge of meteorology is invaluable, but failing that the ability to interpret a broadcast weather forecast can make the difference between disappointment and delight. If the weather map shows a cold front crossing early in the morning there is a good chance of excellent visibility and clear skies. Unfortunately the air behind a cold front is usually unstable, and cumulus clouds build up very quickly to cover the sky. However, when the sun is high in the sky, particularly in summer, the air can be warmed sufficiently to 'burn off' the offending cloud about an hour after midday.

If a warm front is forecast you can almost certainly elect not to fly. If a ridge of high pressure is pushing in from the west, fly on the first day of the ridge and perhaps the second but after that forget it—visibility deteriorates to the point that photography will not be worthwhile. Assess visibility by a horizontal view from a local vantage point. It needs to be at least 16 km to produce good results.

You can fly if the day is partly cloudy, but take time to watch the direction in which the cloud is moving. This is important so that the aircraft—which should be flying upwind of the area you want to photograph—can return quickly as the sun strikes the target.

Coping with haze

Even if the weather is generally fine, you may find that haze is a problem. Sunlight reflected off the haze makes the scene very bright. This confuses reflected light readings and results in underexposure. To overcome this make incident light readings, or reflected light readings from a grey card. If you are using reversal film it is a good idea to bracket exposures, especially for important shots. If you want prints you should use negative film—this has more latitude, and means less worrying about exposure and so gives you more time for composition.

The weather

An extremely important consideration for aerial work is weather. If you travel on an airline on a scheduled flight you have no control over the weather. You also have no control if you are in a light aircraft, but at least you have the choice of going or not.

Perfectly good exposures are possible without bright sun, but without good

travel sickness take the usual precautions. Remember that most sickness is not only caused by motion. Changing rapidly from short sight (checking cameras) to long sight (admiring the view) while in a banking attitude may send a message to your brain that all is not well. If this happens tell the pilot. Always know where the sick bag is—you may be taken unaware!





Haze also causes colour problems in that it gives a blue cast. This can be exaggerated if you use Ektachrome which has a tendency to be 'cold'. A pale amber filter, such as an 81A, improves the colour considerably. You should also avoid using wide angle lenses—a telephoto gives much better results in hazy conditions. This is because a wide view emphasizes the poor visibility and exaggerates the blue cast. Another way of reducing the effects of haze is to use infrared sensitive film which is also useful for crop surveys and other technical applications (see pages 1021 to 1022).

Shooting from a position directly between the sun and the target also reduces the haze effect. But it tends to give results which are very flat. It is better to compromise slightly and choose an angle which gives at least some sidelighting. As your airtime is limited, and because you are moving fast, you do not have much time to compose. So it is often a good idea, when you first approach a target, to fly round once in an exploratory orbit to decide on the best angle at which to photograph it. If you want to photograph just one target, you can make several orbits, using a different lens each time, and this allows you more time to compose. But such decisions must be made in advance if you are not to waste time. If it is your first airborne attempt do not be too

ambitious. Time flies as well as you, and a few good pictures are better than a hundred muffled ones.

Exposure and equipment

For maximum quality it is essential to use a reasonably fast shutter speed to overcome vibration caused by the engine and turbulent bumps. Many aerial photographers try to shoot at 1/500 second. This rarely causes problems if you fly when the weather is clear. In addition, the subject is almost always at infinity, which means that a large depth of field is not necessary. This allows you to use large apertures, and also makes focusing very easy as you can leave the lenses set at infinity. Even so, some professionals still use 200 ASA (ISO) reversal film. If the sun is bright, however, 64 ASA is usually fast enough, and has the advantage of giving finer detail.

You should never hold the camera against the plane to try to steady it. Your body is the best shock absorber, and the best method is to hold the camera normally. If you are shooting through an open window, never poke the camera so far out that it is in the slipstream. Not only is it uncomfortable, it is also much more difficult to hold the camera steady. Remember that even in a light aircraft, your speed is in the order of 160 km/h.

For maximum ease, 35 mm cameras are best. Although medium format cameras give better image quality, they

Past glory An aerial shot strongly emphasizes the circular earthworks around this lonely ruin

can be too bulky for the limited confines of a small aircraft. Do not be tempted to take too much equipment. Lenses wider than 28 mm tend to show too much of the plane, and those longer than 200 mm are difficult to hold steady. Ideal combinations are 28, 50 and 100 mm, or 35, 50 and 135 mm. If possible, it is a good idea to have each lens mounted on a separate body. This saves constant lens changing which can cause you to miss pictures. A motor drive or autowind is also useful when there is no time for careful composition as you can shoot a short sequence or bracket quickly, and choose the best picture later.

A similar approach applies when you are shooting from an airliner, except that you have no choice but to shoot through glass. The windows of most airliners are scratched and frequently dirty, so the results are often far from perfect. Nevertheless it is still possible to get interesting shots of mountain ranges, sunsets over the clouds, and so on. The degrading effects of the window glass are reduced by using a large aperture and a medium telephoto so that the glass is well out of focus. This also applies if you are in a light aircraft and cannot open the window. Also, keep close to the glass to avoid reflections of the camera.

What went wrong?

Using frames

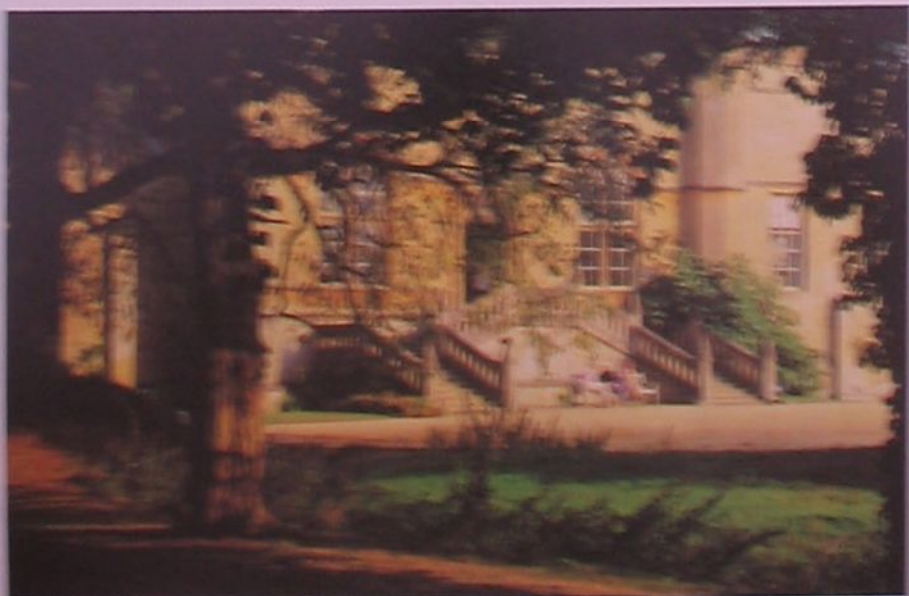
Many good pictures use a natural frame in their composition. Homer Sykes comments on the use of the frames in these shots.



Obviously the photographer has thought about this shot, and timed it very carefully. Unfortunately the result looks rather dull. There are at least two ways of improving the shot, still using the framework of the wall. First, change the camera angle so that the yacht is not so central. Perhaps move the camera to the left slightly so that the yacht is now sailing into the photograph from the right. At the same time lower the camera angle so as to exclude the band of blue sky that runs across the top of the photograph. This does nothing for the overall pattern of the picture. The lower angle would also mean that the horizon no longer cuts through the middle of the yacht's sail.

Second, the yacht could be shot with a long lens and a large aperture. Get as close to the wall as possible so that the rectangle looks out of focus in the viewfinder. This rectangle will blend into the yacht and I think the resulting picture would have a lot more power.

I would use a polarizing filter for this shot in order to darken the blue of the sky and perhaps the sea. At the same time—if the angles were right—it might give more edge to, and brighten up, the wall.



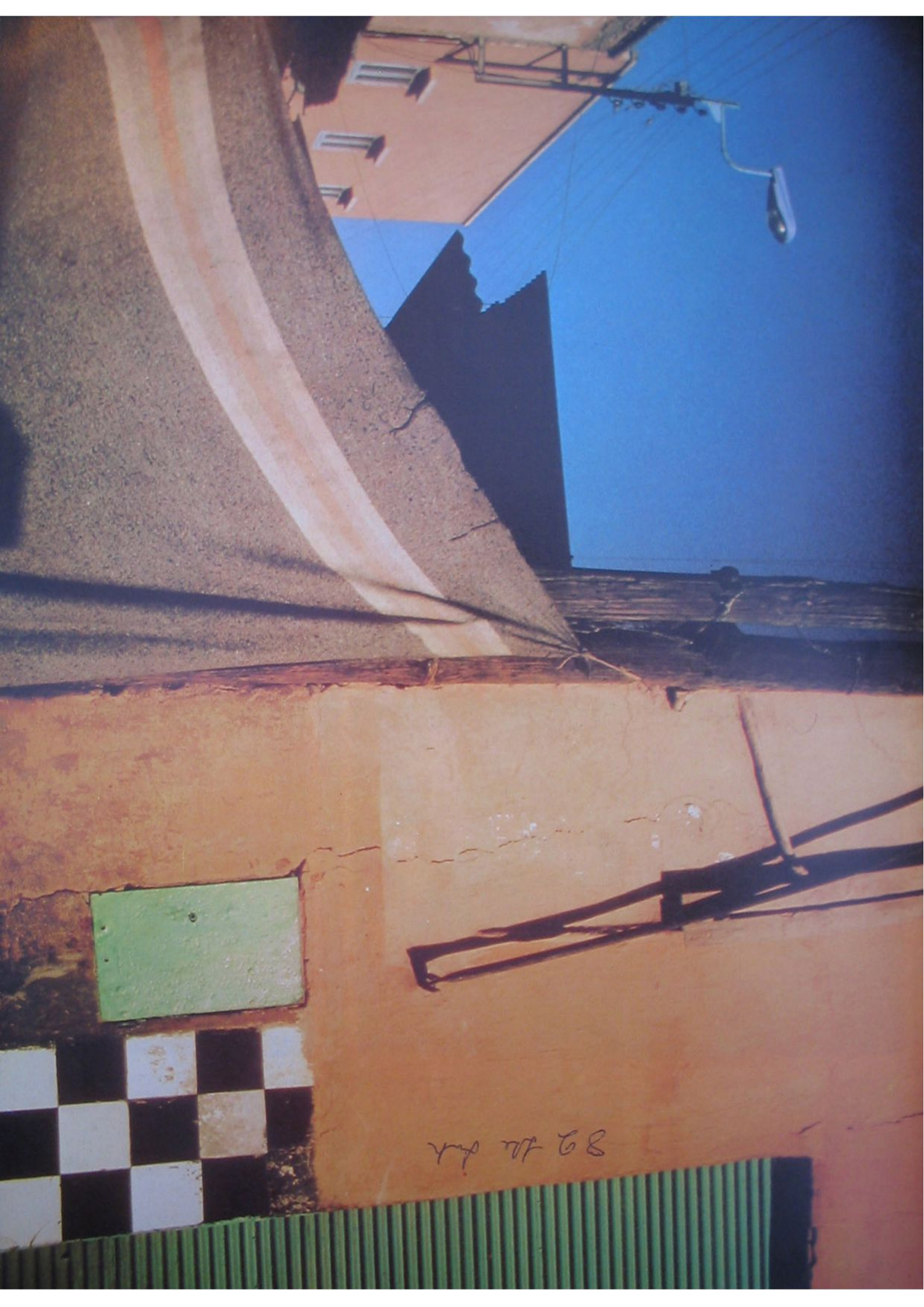
The main problem with this picture of Lacock Abbey is that it is messy. The central point of interest is the doorway and the flight of stairs leading from it to the garden. Unfortunately the doorway has been partially obscured by branches and some leaves, and I find it irritating that I cannot see the person standing there clearly. No thought has been given to the foreground. There is just a hint of something interesting. The light falling on to the path

should have been used to add interest—perhaps a low camera angle is all that is needed.

Framing buildings through trees can, I think, rarely be done successfully. The reality nearly always looks much better than the photograph. Lastly, the picture is spoiled by slight overexposure. It is always worth bracketing your exposures with shots like this just to be certain of finding one good image.



There is not much obviously wrong with this, but it is rather dull. I think the ruined tower should dominate more, which could be done by using a longer lens from further back. It would also be more interesting if there were larger areas in shadow at the top and to the right of the frame. A figure would give a sense of scale and would give the shot more interest. If necessary, use the camera's self timer and move into the shot yourself.



82 the fish

Hardy's houses

Some buildings naturally lend themselves to producing attractive images, others don't. John Sims demonstrates how an imaginative approach can make up for any shortcomings

Often photographers are assigned to photograph places which do not at first appear to be ideal subjects. Nevertheless, they are expected to produce attractive results. And images that are effective because the photographer has worked hard to create something interesting, not because the subject itself is striking, are always difficult to achieve.

The houses lived in by the 19th century English writer Thomas Hardy are cases in point. The most famous is an attractive cottage at Upper Bockhampton, Dorset, a picturesque location photographed by thousands of tourists every year. But Hardy also had a house in London, a nondescript town house now overshadowed by a busy road and a major railway line—not the sort of place that anyone would want to photograph unless they had a specific assignment to do so. We sent John Sims to photograph both of these houses to compare the type of approach that is involved in each case.

Most people who photograph the cottage in Dorset stand inside the fence and frame their shot to include as much of the house and garden that their lenses will take in. John deliberately avoided this approach and tried several different ways of creating a more unusual interpretation of the scene.

The London house was more of a problem. Since there were cars parked in front of the house and a railway line blocking his view, John found that there was no way of obtaining a satisfactory shot at close range. However, by photographing from the top of a tall residential building nearby he managed to frame his shots to include the house, the railway line and the road, creating both an attractive picture as well as making a statement about the changes which have taken place since Hardy's day.

John Sims



Town house The only way John could take a straight shot of the house was to use a 300 mm lens from the top of a nearby block

Country cottage For a broad view of the cottage John waited for the afternoon light and framed the shot to lead the eye to it

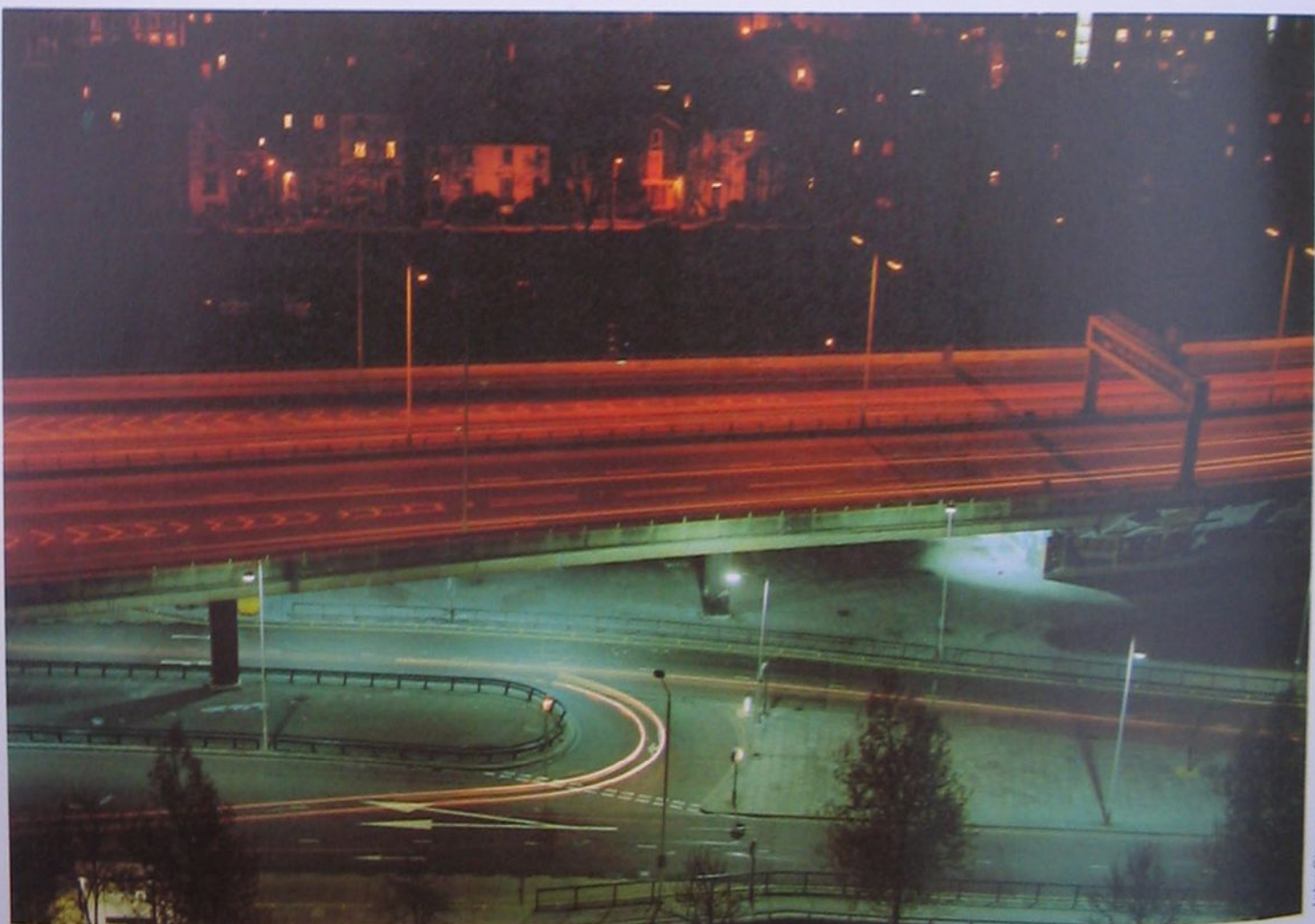




High viewpoint Shooting from a nearby building, John used a range of lenses on his Nikon, depending on how much of the surroundings he wanted to include

Busy neighbourhood To show how much things have changed since Hardy's day, John deliberately included the busy surroundings. He waited for the buses to pass to add colour

Night time By using an exposure time of 60 seconds, John recorded the trails of car lights on his Kodachrome 64 film. 55 mm lens at f/8, and the Nikon F2S mounted on a tripod





Cottage at night The dusk light helped create an atmospheric study of the old building. The interior lights added to the mood of the scene. 30 second exposure, 24 mm lens at f/8

Through the foliage For a more unusual shot, John deliberately framed the photograph through a bush in the garden. The red blooms added colour to the muted tones and were deliberately defocused

Window For another successful night shot, John focused on the portraits of Hardy which were hanging inside. His Nikon F2's TTL meter gave the right exposure for the interior but John still bracketed



DIY Lightboxes

A lightbox can assume the status of 'essential accessory' in many photographic applications, particularly in relation to darkroom work. Ready made they are expensive, so why not design and make your own?

A lightbox is an accessory which few photographers would put near the top of a list of essential items. But its usefulness and versatility make it the sort of unit which, once you have one, rapidly becomes indispensable, and after a while you wonder how you ever managed without it.

As well as its obvious use for sorting slides, a lightbox can be used for examining negatives, cutting and tracing film, spotting out defects on negatives, providing illumination for copying transparent objects, and even for giving a diffuse source of light for black and white studio work.

Probably the main reason that more amateurs do not own lightboxes is that they are comparatively expensive—particularly if they are of a larger size rather than being small slide sorters. But if you make your own, you can own one for quite a small outlay. The work involved can be handled by anyone with a small range of tools and an elementary knowledge of wiring.

Although this article describes a specific unit, the basic instructions can easily be adapted to suit your own requirements. You could, for example, build it into a working surface in the darkroom, or elsewhere.

Lightbox application

Before you start to make a lightbox you should consider the conditions under which it will be used, as these determine the design and type of the important lighting elements it will contain. Tube length and wattage influence the light output of the lightbox, so before you choose the lighting tubes decide where your lightbox will be used. A lightbox used in a brightly lit office has much lower apparent brightness, or luminosity, than if it was used in somewhere like a darkroom, even though its actual, measurable brightness, or luminance, remains the same. In fact, in poor lighting, the glare of a bright lightbox can cause acute discomfort, especially if you have to switch continuously between the two extremes for viewing and working.

For a low output lightbox, simply use the shortest length of tube you can. For high output, fit as many tubes into the available lightbox enclosure as possible. Alternatively make a high output

Home-made lightbox. Although the cost of the lighting components can be high, making your own lightbox can save you a great deal of money. The design for this box is shown opposite

box with switches that allow some tubes to be switched off—then you can use the lightbox in dark and bright conditions.

Tube types

Many types of tube can be used in a lightbox. All will provide the necessary lighting (see table page 2039) but the 'warm' ones, in particular, may prove quite unsuitable for accurate colour assessment. If this is an essential requirement—where it is vital to match colours from a photographic, rather than visual, point of view—then special tubes such as Graphica 47 must be used. These are about five times the cost of the 'ordinary' tubes listed, so for general purpose work choose bulbs from the top half of the table (over).

The efficacy of a tube is its lumens/watts rating and indicates the relative brightness when tubes are compared. A low efficacy tube combined with a thick diffuser may mean that more tubes than normal may be needed for a certain level of luminance. High efficacy tubes should be chosen when the fewest possible tubes are required for a lightbox with high luminance.

Although most tubes are straight, circular (warm white) and U-shaped tubes (white, warm white and plus white) can be used instead. One manufacturer even provides a 'concertina' form (daylight) with a power and light output to match a straight 2400 mm tube (see illustration). These shaped tubes enable you to cram a lot of tube power into a fairly constricted space.

The lightbox shown here was designed for four 600 mm tubes, but could accommodate as many as six—or as little as two—with only slight modification.

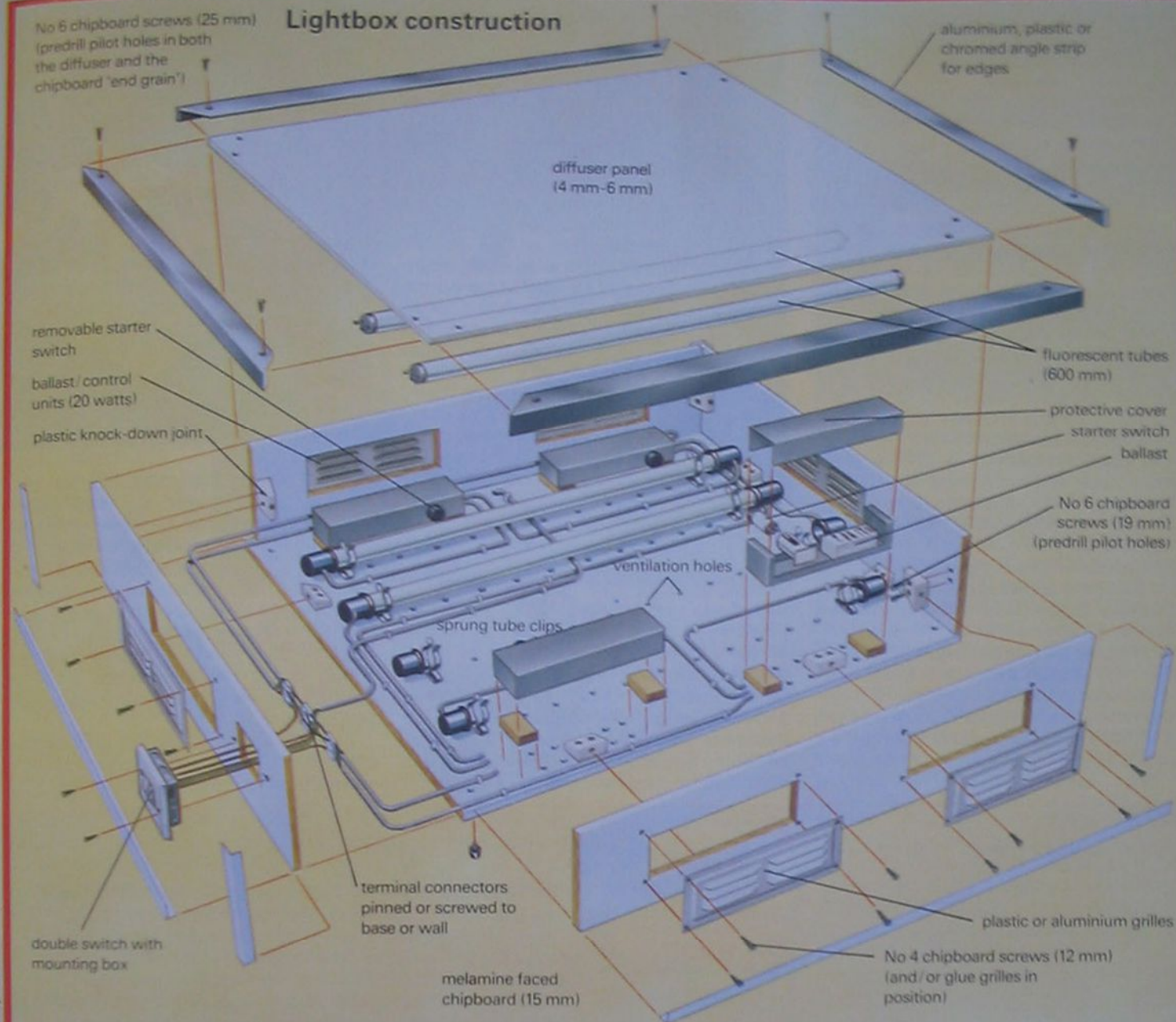
Controls and wiring

Fluorescent tubes need special control gear to provide high enough voltage to initiate the discharge which causes the tube to light. Various methods are employed but one of the simplest consists of a simple choke or capacitor ballast (or a combination of both) operated in series with the tube. A starter switch is connected across the lamp to initiate the striking sequence, a standard method now used for most domestic applications. A typical circuit is shown, along with a circuit diagram for four controls as used in the lightbox design shown here. It is based on the use of ready assembled control units which need only be connected to a switched and fused mains supply for use.



Tessa Musgrave

Lightbox construction



Replacement tubes

Tubes have a useful working life of around 7500 hours—or longer if you can tolerate working with light output fall off—so many years may pass before a replacement becomes necessary. Tubes which need replacing more frequently include those used for colour balancing and assessment. All tubes should be replaced if blackening of the tube phosphor occurs at each end—but by this stage light output is likely to have reached an unacceptably low level.

If you are planning to make a fairly lightweight, portable lightbox, there is a much greater risk of tube failure caused by physical damage. No tube is likely to withstand constant jarring without suffering—and those fixed rigidly to the structure of the lightbox may well smash if the lightbox itself is badly knocked or dropped. Loosely fitted tubes may smash against the interior of the box.

Unless the tube comes with its own batten fitting, use proper tube clips to

keep it firmly in position. Plastic types have enough 'give' to absorb all but the hardest knocks a lightbox may receive.

Solidly constructed desk lightboxes need not be provided with an access panel for tube or starter replacement—this occasional job can be done by removing the diffuser panel, for instance. But do allow at least some means of access otherwise you may have to destroy at least part of your construction if a fault occurs.

Incorporate a special access panel if you are designing a lightweight, portable lightbox. For example, use external screw fixings for the base (or one of the sides) rather than nails, glue or internal fixings.

When thinking about tube life, remember that frequent switching, combined with short running periods, can seriously accelerate tube failure—and these are precisely the sort of conditions to which a lightbox is subjected. A tube's rated life is usually

based on a continuous running time for each start of three hours. By cutting this to one hour's continuous use each start—probably far longer than required for the occasional use of an amateur lightbox—the rated life is cut by half.

The diffuser panel

White opalized acrylic sheet is the best material to use for the diffuser panel but PVC or polystyrene sheet with the same transmission characteristics may prove suitable. However, these are rather brittle by comparison.

Acrylic sheet 4 to 6 mm thick provides the best compromise between transmittance and dimensional strength needed for a panel supported by its edges only. Opal acrylic sheet may be available in various diffusion strengths. Perspex '050' grade, with 45 per cent transmittance is preferable to the '030' grade (78 per cent transmittance) as its diffusion characteristics are very much better—but more tubes may be needed to compensate for

the much higher light loss.

Suppliers will cut sheet precisely to size. You can get the edges polished smooth at the same time, for a small additional fee—and this may considerably enhance the appearance of your completed lightbox where the edges remain visible.

The panel can be fixed in several ways to the top of the lightbox. The material is easily worked using normal woodwork tools and can be drilled to accept screws, perhaps the simplest method of fixing. Use a countersink bit so that the screw head lies flush or beneath the surface of the diffuser.

Another method is to use plastic or metal angle strip to anchor the sheet in position by its edges. This strip could also be used to finish off any other method of fixing—chrome strips would give a very professional finish.

Yet another method is to use small mirror clips (as also used for pinning glass to a picture, or glass to a table).

Finally—and if your woodworking skills are up to it—actually rebate the sheet edges in the sides of the lightbox. No additional panel support should be necessary if the panel fits the grooved recesses tightly all round.

Acrylic sheet is very easily scratched and so you should avoid cutting directly on a diffuser panel made of this. But one of the attractions of a lightbox is that you can do all your viewing and 'bagging up' operations and negative cutting more or less simultaneously, using the

lightbox rather like a worktop.

Some protection can be provided during actual cutting operations by using a thick sheet of plate or float glass placed on the plastic diffuser.

But if you plan to use your lightbox mostly for trimming and cutting—rather than simply for viewing—it may be better to use white opalized plate of float glass for the diffuser panel. Glass is not without its disadvantages, however—it is extremely expensive in opalized form, is heavy and it must be of the correct thickness for any given area, remembering it receives support only at the edges. It is also very easily cracked and therefore quite unsuitable for a portable unit.

Glass which is 4 mm or 6 mm thick should be suitable for a small size lightbox using 20 watt or 30 watt tubes. This can be fixed in position with angle strip or mirror clips, or by screws if you can have the glass drilled to accept these. As a precaution, particularly if the edge is left exposed after fixing, ask the glazier to polish the edges smooth.

Ventilation

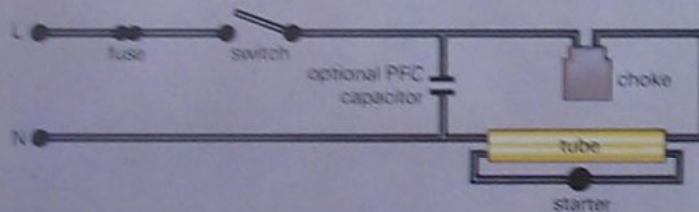
Tubes operate best in ambient temperatures of around 25°C. But the enclosed space of a lightbox can act like an oven to raise the operating, or tube-wall temperature to levels way in excess of the normal ideal, 40°C. Air temperature within the lightbox at 50°C, for instance, results in a tube wall temperature of about 70°C. This results in a light output drop to about 70 per cent.



Tessa Murgrave

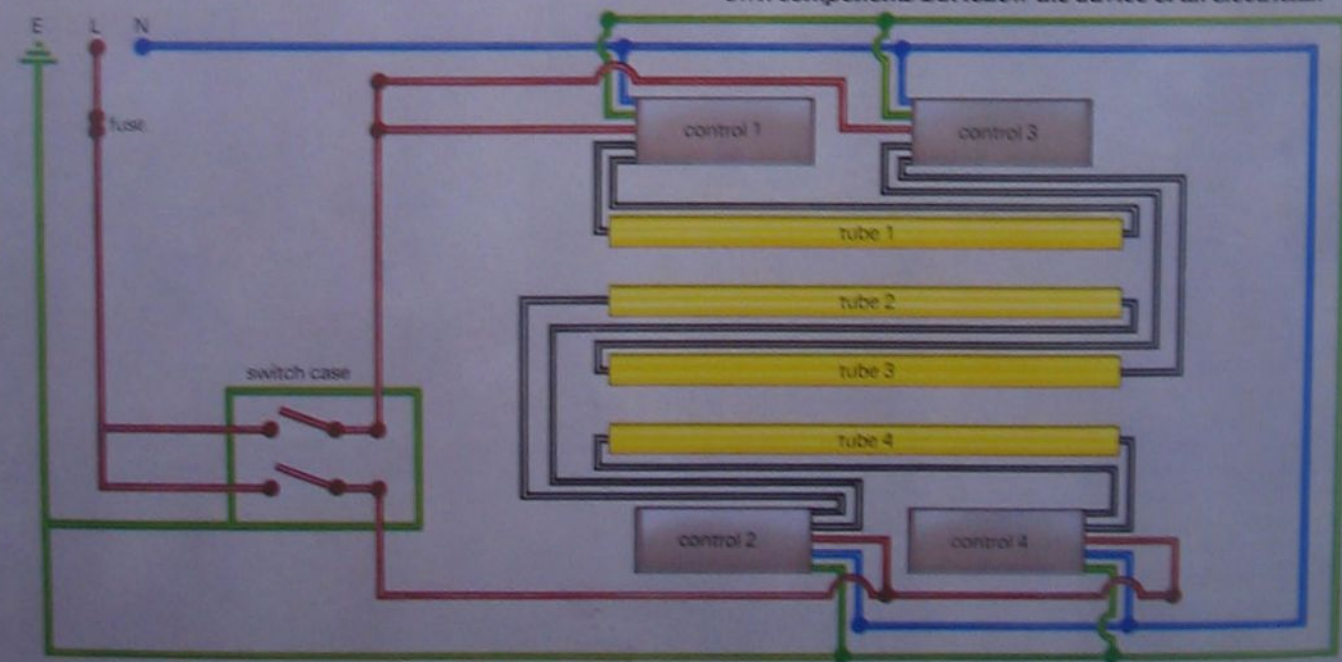
While this reduction of light output is merely inconvenient, the heat generated by the tube and its control gear must be checked by adequate ventilation of the lightbox interior. Otherwise you risk damaging the lightbox diffuser panel or overheating material placed on the lightbox for viewing. More serious are the risks of high levels of transmitted heat which could cause personal injury on contact, as well as constituting a very real fire risk.

Ballasts employed in the control gear can attain surface temperatures of 100°C even under normal conditions—and sig-



Lighting circuits

The layout of a standard starter switch circuit, with optional PFC capacitor, is shown on the left. The ballast, or choke, capacitor and starter switch can be obtained in a unit which requires only the addition of a tube, switch and plug to become operational. Ready-assembled units such as this are sold for gardening and aquarium use. Or you can wire up your own components but follow the advice of an electrician.



Retouching A useful application of a lightbox is to provide good back-lighting for retouching—a frequent and often necessary chore if you use lith film.

Cutting If you use your lightbox for cutting film in strips, or to size, place a sheet of glass on top first to prevent scratches. Have the edges ground smooth. Use thick plate or float glass, of the strengthened type if possible.

Tube type You may choose to use shaped tubes (far right) in your design. Miniature tubes are available also

Tessa Musgrave



generously sized ventilation holes or grilles. Only minimal ventilation need then be provided for the tubes.

Lightbox construction

Melamine faced chipboard or other plastic coated board is probably the best of all the wood-based materials that could conceivably be used for constructing the actual lightbox. Its one drawback is that it is thick and therefore heavy. But otherwise it is easily worked and requires no painting. You can use white melamine faced board for the lightbox interior, and patterned board for the exterior if the same board does not serve both functions.

Manmade board of this type is usually sold for shelving or for simple furniture construction, and is usually available in a set range of lengths and widths. Shelving widths would be suitable for making the lightbox walls, but a much wider piece would be needed for the base—and it is this that should influence the design of your lightbox. Shelving up to 60 cm wide is perfectly suitable for a lightbox similar to the design shown here.

The easiest method of joining the board is to use knock-down plastic block joints located at the ends of each join. The various pieces can be sawn to make butt joints as shown in the various box designs, then drilled, to provide ventilation holes prior to assembly.

However, you may prefer to use a system of pin/dowel joints in conjunction with corner and edge supports cut from suitable pieces of planed softwood. This gives a much stronger box construction.

Plywood is another very useful material for lightbox construction, but must be properly painted afterwards. Use WBP ('water and boil proof') or exterior grade ply as these are less likely to suffer from the heat build up within the lightbox.

Paints used for interior finish should be brilliant white, glossy or matt, but—above all—capable of withstanding high temperatures. Your local supplier should be able to help you choose something suitable. Radiator paints and paints specified as being suitable for painting hot pipes can be used.

nificantly more in a lightbox enclosure. It is this component of a fluorescent light fitting which needs particular attention when you are planning your lightbox design. If it forms part of a complete control unit, this should be treated like an independent ballast and located well away from the diffuser but near to ventilated grilles or holes provided for cooling.

A simple system of grilles or holes along each side of the lightbox can prove entirely adequate, though grilles are

neater. The main problem with these simple systems is that they must extend to all sides of the lightbox to be effective—and this results in a substantial amount of light leakage which may prove unacceptable. However, a slightly more involved lightbox construction enables you to use a baffle system to cut down this annoying spillage.

All-in-one control units can safely be located outside the lightbox enclosure, ideally in a well beneath. This could be open to the air, or provided with

Tube characteristics

Tube colour	Colour temperature	Colour appearance	Colour rendering	Efficacy (l/w)	Usual application
Artificial daylight	6500K	cool	excellent	30	low efficiency but best colour rendering
Northlight/Colour matching	6500K	cool	excellent	42	accurate matching of colours
Daylight (cool white)	4300K	cool	fair	67	general purpose: to blend with daylight
Kolor-rite	4000K	neutral	excellent	46	best colour rendering for general lighting
Natural	4000K	neutral	good	52	general lighting applications
Plus white	3600K	neutral	good	67	general lighting with good rendering
White	3400K	neutral	fair	70	general lighting at maximum efficiency
Warm white	3000K	warm	fair	69	general lighting at high efficiency
Home-lite (USA)	2600K	warm	good	62	for giving interiors a 'warm' appearance

Improve your technique

FASHION

Fashion photography may seem simple, but there are many tricks and techniques you can use to add sophistication to your shots



Many people think that fashion photography is simply a matter of dressing someone up and putting them in front of a camera. But in fact, to get the high quality results which you see in magazines, fashion photographers use a number of special techniques.

The main difference between this sort of work and other photographs of people is that, in fashion photographs, you are trying to show the clothes to their best effect rather than just producing attractive pictures. Many of the special techniques are therefore concerned directly with the clothing and model rather than the photography, though photographic techniques, such as lighting, do also play their part.

It is virtually impossible to take and produce sophisticated pictures with a tatty dress on a disinterested model. So these are the aspects which have to be considered long before shooting starts.

The clothes

If you are photographing the clothes for an assignment, you are unlikely to have much of a choice as to the garments you use. But if, as is more likely, you are shooting for yourself, then the choice is wide. It is best to choose the clothes to fit in with a previously worked out idea rather than selecting at random. You should always have some idea of the mood or appearance which you want to create so that everything—including model, location, props and so on—can be chosen to match.

Bear in mind that some garments

Producing the shot Quite complicated set-ups (below) are often used to produce apparently simple shots (left). Equipment used in this shot includes a wind machine and a heater, which was needed to keep the model warm in the breeze!



Before and after Skillfully applied make-up can make a world of difference to the model's appearance



Faking it In this shot earrings were used to liven it up. The model's ears were not pierced so tape was used



Livelier shot By adopting a more striking pose the model helps to make the most of clothes and accessories



accentuate the apparent horizontal bulk of the model. These include heavy woollen pullovers, bulky satins, full skirts, large patch pockets, horizontal patterns (especially stripes) and light colours. Conversely, a slimming effect can be achieved through the use of dark colours, vertical patterns, and materials which tend to cling, such as silk, jersey, crepe or chiffon.

Make sure that all the clothes are pressed or ironed before the session. It is a good idea to have an iron at the session too, so that any creases caused by the model can be removed during the shoot. If the clothes are being taken to a location, pack them with tissue paper, or put them on hangers with plastic covers

over them.

You should always take great care over the clothes, especially if they have been borrowed. The neater the garments, the better your pictures will look. Never pull loose threads as they could let down a hem or, worse still, gather or snag the material in a way which is difficult to repair. It is better to cut off loose threads or to tuck them out of the way. When your models change garments, tell them to be careful of getting make-up on the clothes. Most professional models use scarves to cover their heads when changing to avoid this problem.

You frequently find that the clothes do not fit exactly. Even garments belonging



Outside flash The sun is a useful light source. But to keep detail in the subject, especially when it is backlit as in this shot, it is a good idea to use fill-in flash or, at least, large reflector boards

stockings, hats, scarves and so on, can make a great deal of difference to the final appearance of the picture. This is an area which calls for as much creativity as taking the photograph itself, and professional photographers often hire stylists to find and choose accessories.

Always pay close attention to details. Small things such as bra straps and zips out of place are easy to miss when you are shooting but become very noticeable when looking at the prints. Check that seams are straight, buttons are buttoned, and so on. If the model has previously been wearing a watch or tight clothing (such as socks) make sure that any impressions left by these have faded before you shoot. Another problem occurs if the model is wearing a clinging dress or tight trousers, in that the lines of the underwear show through. It is far better if the model wears nothing under such clothes.

The model

Once you have decided on the clothes and accessories you want to photograph, you can then choose someone to wear them. Sometimes the two decisions are made together, or there is little choice—such as when the model is supplying the clothes. But if you have a choice of model there are certain things to look out for.

Your model should be attractive, though there is no reason why he or she has to conform with the somewhat anonymous and often characterless appearance of many professional models. The main advantage of working with a professional is that the model has experience and will often come up with ideas for poses, props and accessories, and is more likely to be able to supply the latter. Nevertheless, professional models can be expensive, and for the sake of a relaxed working atmosphere it is often better to use someone you know.

The model, whether male or female, should have a good complexion. However, minor blemishes can be disguised with make-up and (in black and white pictures) by slightly overexposing the film—half to one stop is common. The hair colour should be natural, unless you are after a 'way out' look. Hair which has been dyed black or blonde does not photograph well as it tends to appear rather flat.

Hair should be freshly washed so that the natural gloss shows through. Avoid using heavy lacquer to keep it in place. It is useful if you can find a model who is good at arranging his or her hair in different styles—with women it is usually

to the model can often be improved in this respect. To improve the fit, gather the material together, out of view of the camera, and clip or pin it. This gives the clothes a better shape and makes them look as though they were 'made to measure'. For this purpose it is useful to have items such as clothes pegs, masking tape, pins and bulldog clips to hand.

Other improvements can be made by the model's pose. For example, jeans can be very difficult to photograph if they do not fit properly. If the seat looks a bit baggy get the model to bend forwards. If the jeans are loose around the thighs get the model to raise one leg by placing a foot on a box or stool. This 'tightens' the appearance of the jeans as well as

accentuating the length of the model's legs. For very full garments ask the model to twirl around as this visually lightens the bulk.

The best pose for the model usually depends on the mood you are trying to create. A formal, sophisticated effect is most easily achieved by a still pose. A livelier effect can be created by getting the model to move and then freezing the action with flash. A wind machine also helps here—a powerful electric fan will do. However, this is an area in which you can experiment.

You should also think carefully about any accessories which you use. It is essential that they match not only the clothes, but also the general mood of the picture. Belts, jewellery, shoes,

hairs if they have long hair as this offers a greater range of possible styles or arrangements.

With female models it is a good idea to have several collars, sweaters or tops available to give a lift or cut to the hair. Always tell the model what style you are after—she or she may have a much better idea of how to achieve it than you. However, it is useful if you know something about it yourself so that if the hair falls out of shape during the session you can adjust it yourself. If the model has to go to the changing room to do it, the whole mood or rapport can be broken.

Rapport between you and the model is important. Whether of you is nervous, this shows in the pictures. If you are both relaxed the session is likely to be more successful. It is a good idea to have music playing—you can ask the model to bring along his or her favourite music. You should display confidence in what you are doing, but at the same time be willing to listen to advice from the model on important things such as make-up.

Make-up is a difficult subject. It can add a veneer of sophistication to a shot, or ruin it completely. A subsequent article covers this subject in greater detail, but there are a few general rules which you can follow.

There are some colours which look terrible when photographed. Bright red in particular tends to dominate the picture and frequently appears black in black and white shots. Pastelised colours or light tones also cause problems as they tend to photograph lighter than skin tones—if you use a light coloured lipstick your model may appear to have no lips. The make-up colours you choose should fit in with the garments. This is another area where there is plenty of scope for experimentation. But for most purposes the best colours are pastel pink, oranges and browns.

Make sure that whatever make-up is applied to the face does not change the skin colour or tone in relation to the neck, shoulders, and so on. If they appear in the picture. In such cases, body make-up may have to be applied, especially for colour work. This is particularly a problem with models who have sunbans, as faces lose their tan faster than other parts of the body, and is especially noticeable on men who shave.

The location

Make-up can achieve a great deal, but probably the most important feature as far as mood and atmosphere are concerned is the location. This can be a studio, a normal room or outside—indeed almost anywhere. Generally the location is chosen to suit the mood of the clothes—a restaurant makes an ideal setting for evening clothes, for example. But the location does not have to be too elaborate. Often a plain background is

best, the atmosphere being created through lighting.

Always be on the look out for possible locations and keep a notebook of where they are. With outdoor sites, check whether there are any changing facilities for the model such as public toilets. If not you will have to provide something. The type of changing tent used for camping is useful if there is somewhere to pitch it. Otherwise a roomy van is the best choice.

If your shots are to be taken in the street you should check with the local police to see if a permit is needed. In many areas, particularly cities and parks, you need a permit if tripods or lights are used. When asking them, enquire whether any roadworks or other activities are likely to be going on when you want to shoot. You should also check on insurance—you may need to be covered for public liability (this is certainly the case at airports). It is also a good idea to have insurance cover for the models and the clothes.

Having found a suitable and usable location, work out in advance the main shots you want to try. Nothing is worse than arriving at the location with the model and then being stuck for ideas. Remember to check that the model has worked outdoors before as onlookers can be intimidating for a beginner.

Clipped clothes To give a better fit and make the clothes look neater, you can gather loose material and clip it, out of sight of the camera. Here a clip has been used to tighten the waistband of the girl's jeans which were originally very loose.



Before setting off, make sure you check the weather forecast. If it is likely to be cold, take flasks of hot drinks and blankets or rugs to keep the model warm while you are setting up shots. Make-up should be applied at the last minute to stop it from being accidentally smudged on the way, especially if the location is some distance away.

Always take as much equipment as you can, including extra lighting, lenses, reflectors, and so on. This is so you can change your plans should the weather prevent you from carrying out your original ideas, or should you get any additional ideas. Also, remember to take along some props such as a ball, umbrellas, hats, magazines, and whatever else you can think of. All this adds up to a lot of equipment, and this is where a van comes in handy.



Nick Calanoso

Natural shot The most effective shots are often the simplest, using quite straightforward photography and with the model posed naturally.



Victor Yuen



Victor Yuan

Moody grain To create mood or produce unusual results, try using special films. Kodak recording film Type 2495 was used here because its coarse grain gives a striking effect

The lighting

Whether you shoot on location or in the studio, lighting plays an important part in the final picture. It is important to remember that the idea of fashion photographs is to show the clothes, and this usually means that they should be well lit. The lighting should ideally be arranged in such a way that both colour

and texture are well displayed. However, even in professional work, this all too often results in pictures which are boring. The problem is to strike a compromise between straightforward illustration and creative lighting. To do this requires practice and experimentation, though much can be learned by looking at the work of the top professionals and trying to work out how they have lit particular pictures.

If you want a natural look, then normal daylight is hard to beat. Often all that is needed to control the light is a reflector made from white or silver card to fill in

the shadows. This is important if you are using sidelighting to pick up the texture of the material. Without any fill-in light the shadows tend to be too harsh, and contrast can be a problem, especially with colour reversal film.

For more sophisticated results, fill-in flash can be used, though for the inexperienced photographer this method is slightly more difficult as, unless you use flashguns with modelling lights or can shoot test Polaroids, you cannot see the effect of the flash until the film is processed. Nevertheless, fill-in flash gives you more control as you can vary the balance between the existing light and the flash (see the article on pages 2068 to 2074 on naturalistic flash).

If you are on location, try to make the most of the light sources around you. When shooting in black and white you can use everything from table lamps to streetlights. If you are shooting in colour, though, be careful of the colour temperature of your main light source. True fashion shots should show the natural colour of the garments. Once again, fill-in flash can be used, this time to 'clean up' colours without destroying the atmosphere of the existing light.

Sometimes, however, it is impossible to get completely accurate colours. This is because some dyes used in materials do not record correctly on film. Oranges are particularly difficult, and sometimes green dyes come out brown.

If you want complete control over the lighting, the best place is the studio. The standard approach to fashion is to use a fairly diffused main light at 45° to the subject (relative to the camera) and then use reflectors to fill-in. But here, as elsewhere, it is best to experiment to find what best suits your original idea, the clothes and the model. However, you should avoid using lighting that is very harsh or exceptionally soft. Harsh sidelighting shows up even the slightest crease and is rarely flattering. Very soft lighting, on the other hand, gives poor colour saturation and can make the picture look very flat.

Adapt, adopt and improve

Fashion photography is interesting because you are in complete control over every aspect. This makes it a very challenging and often difficult branch of photography if the results are to be anything other than straightforward record shots. It is important to try different methods and approaches. For example you could try using unusual film stocks such as black and white infrared or 2475 Recording Film, both of which give a romantic, grainy effect. Or try using a wide angle lens and a low viewpoint to make the model look taller (some photographers use perspective control lenses, or movements on large format cameras, for this purpose).

Viewpoint

Whether shooting from the eye level of a bird or a worm, or simply from your own normal standing position choice of viewpoint is a vital photographic element

Choice of viewpoint is one of the most obvious creative tools available to the photographer. Although it is an integral part of the picture taking process—simply the direction the camera is pointing in relation to the subject—it is also one of the easiest ways of giving more impact to a photograph. All too often people become lazy about looking for a viewpoint which is appropriate to the subject and end up with nearly all their photographs taken from eye level.

Most of us become totally accustomed to seeing our surroundings from eye level so that looking at photographs taken the same way is less likely to generate much impact. However a carefully chosen viewpoint might provide a strikingly unusual view—or it may offer the ideal viewing angle to appreciate the design of a house or an exotic car. This viewpoint need not necessarily mean an extreme—after surveying a location you may well conclude that eye level is actually the best way of photographing the main subject.

Allied with viewpoint are other factors—lighting, choice of lens and deciding what to include and what to leave out. But these usually follow on from the more fundamental decision of where to take the photograph from. The lighting and the range of lenses at your disposal often have their limits but there is an almost infinite number of ways to view a subject—a phenomenon that is often what distinguishes the work of one photographer from another.

Angling a camera so you view your subject from below brings certain characteristics to a photograph. A low viewpoint can create an unusual juxtaposition—perhaps a close-up of a cricket ball in the foreground photographed from ground level with a game of cricket visible in the background. However a low viewpoint can also create a sense of power, dominance and menace. The power of a racing car is much more graphically conveyed by shooting across the car from its own level, or from below it, than from a high view looking down on to it. Similarly, a low wide angle shot of a famous personality—perhaps a politician—will convey more of a sense of their power than a shot looking down onto them. This is one reason why speeches are made from elevated stages. The low viewing angle adopted by Frank Hermann for his photographs of soldiers at drill (see page 39) has a similar effect and gives the viewer a strong sense of the power and authority invested in the subjects. In this case it was not an extreme position—it was simply a matter of shooting from a squatting position rather than from normal eye level.

A low viewpoint can also be invaluable in a more pictorial way. It can allow you to give less emphasis to a featureless foreground—perhaps by using a wide angle lens and framing a landscape between some flowers—or even between some blades of grass. The



Garden The intricate layout of a formal garden cannot be fully appreciated from ground level so the photographer used an adjacent building for this shot



When photographing from a building or some other high viewpoint, telephoto lenses are often ideal for closing in for a bird's eye view of the people below. However, telephotos are also ideal for concentrating on the patterns which are often visible from above. The way pavements and roads are arranged, the lines on the road or a group of trees in a city square can all create interesting patterns that are rarely seen otherwise. In the same way, an intricately laid out garden will make a fascinating subject from above—such photographs generate interest from the viewer simply because what they see is such a departure from the normal view.

Many subjects lend themselves to this treatment—whether a view from a mast looking down on to a yacht, a bird's eye shot of a tennis player serving, or a row of swimmers competing in a swimming pool. Often, hazardous climbing exploits are unnecessary and it is not hard to find a vantage point once you have decided

exaggerated perspective which such a viewing position creates can also be used effectively. A classic example is of a road or section of railway line stretching off towards the horizon. A low viewpoint will make the convergence more dramatic and will allow the photograph to include details in the foreground such as the texture of the road itself. This technique also allows the eye to be led towards a significant part of the picture and is similar to the effect created by framing a shot so that a wall or hedgerow leads your eye into the distance.

In contrast, the opposite extreme—finding an unusually high viewpoint—also gives its own characteristic effects to a photograph. Try looking down from a fairly high window on to the street below. Pedestrians walking along or standing on street corners take on a very unusual appearance. This effect of a high viewpoint can be exploited with dramatic results. People or animals, for example, take on almost unrecognizable shapes when viewed from above—often the main clue to identifying the subject is provided by the shadow that the shape casts across the ground.

Low shot By lying on the ground beneath the marksman, the photographer created a sense of menace. **Modern architecture** The convergence caused by using a wide angle lens from a low viewpoint adds emphasis to an unusual design. **Rear view** Here the choice of viewpoint created a striking image of a familiar subject. **Tables and chairs** A high viewpoint allowed the brightly painted objects to be contrasted with the surrounding foliage and resulted in this particularly striking image

Café A viewpoint need not necessarily be an extreme—here crouching helped the overall composition

Cat Animals benefit from being photographed at an angle corresponding to a scale of their own world



A. Carpi/True Image Bank

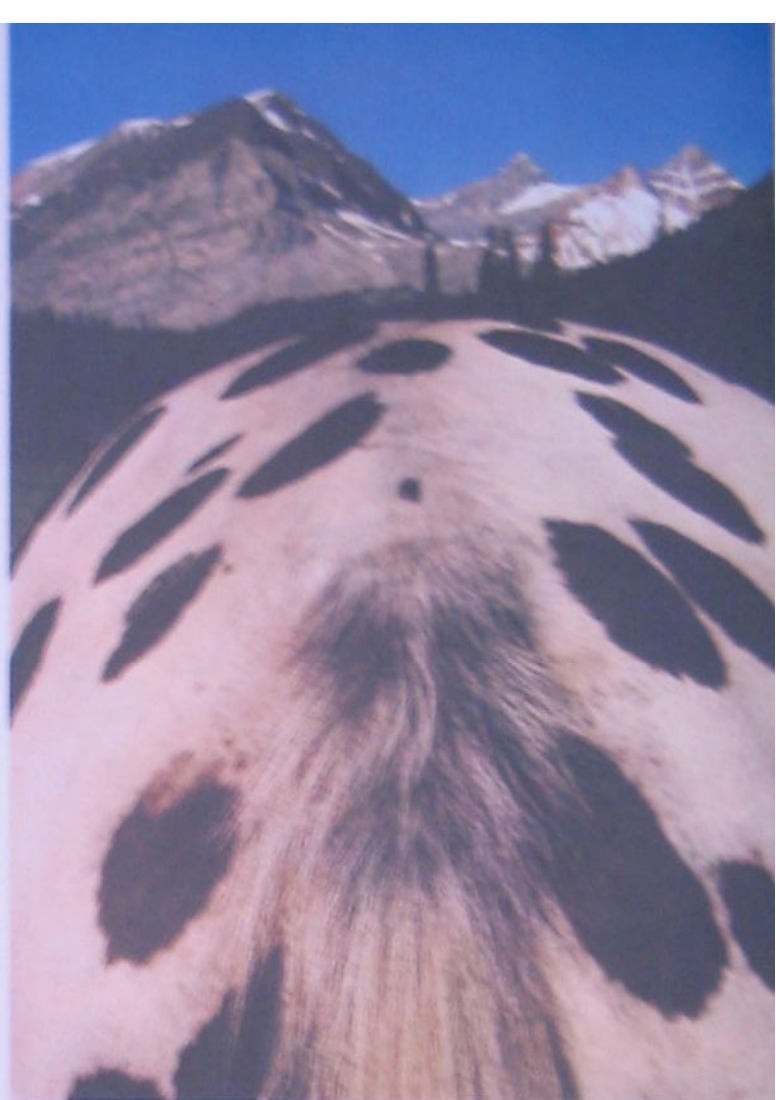
Reflejo/Susan Griggs Agency



Adam Wozniak/Susan Griggs Agency



Les Derrins: The Image Bank





airline pilot, confronted with a huge array of dials and switches, are both examples of this. The view of a performer confronted with a large audience is another—and in all these cases the photograph gives a more involved glimpse into the world of the person concerned. Similarly, photographing a child from above imposes an adult viewpoint—a far more natural choice is to crouch down and shoot from the child's own level. The idea of a point of view can be taken a stage further such as by placing a camera fitted with a fisheye or ultra-wide angle lens inside a rugby scrum or an American football huddle, to give dramatic results.

Choice of viewpoint can often be limited by obstruction but in such cases it is often best to try to make a feature out of the problem. In a crowd for instance, why not frame the main subject between the heads of the people in front of you? If the subject is a house, surrounded by high walls and a gate, forget about trying to shoot between the railings of the gate and angle the shot so that the gate becomes part of the final photograph and frames the house in the background.

While there is plenty of scope for manipulating your viewpoint to create a more striking image, do not be diverted away from the most straightforward viewpoints on every occasion. A simple front or side view may be the best. The general rule is to check out all of the alternatives, and even photograph the same scene from as many vantage points as possible. You may find that each photograph is as effective as the others or your practical experience may teach you that some viewpoints suit a particular subject far more than others.

Washing Even a subject as mundane as a washing line can be turned into something interesting by choosing an original viewpoint. **Feet** An unusual and effective approach—yet this was taken from eye level. **Camels** Animals viewed from above appear almost unrecognizable—only their shadows tell what they are so remember to give some pictorial clue

Claude Lévesque Atlas Photo

that elevation would improve your view of the subject.

On a more practical note, elevated viewpoints can be indispensable for allowing yourself a clear view of the subject. A photographer may carry a small step ladder along to an event, for instance, so that he or she can see over the heads of others present and get a more unusual view of the proceedings—perhaps deliberately including the heads of those in front.

While high and low viewpoints each have their own ways of shaping the image, often the viewpoint is dictated by the subject itself. Using the camera from someone else's viewpoint—perhaps even photographing over their shoulder—is an ideal way of presenting the elements of a scene. The view of a train driver looking through his cab window out onto the tracks ahead or of an

Nina Kellgren



Jon Gardey/Robert Harding Picture Library





Coloured cross lines on a stationary filter produce the cross-shaped rainbow effect

that causes the phenomena associated with diffraction.

Colour bars

When light waves are diffracted past a sharp opaque edge, long wavelengths—that is, red—are affected more than short wavelengths (blue) and so red light is bent farther than blue. This differential bending of different wavelengths splits white light into a spectrum.

This effect is only really noticeable if instead of a single edge, there are many edges. Special screens called *diffraction gratings* are used to form spectrums with large numbers of narrow slits. A diffraction grating consists of a regular series of fine lines ruled on glass, which will either transmit light or given a suitable coating, reflect it to produce the same effect.

The diffraction grating is useful for a number of scientific purposes such as spectroscopy and X-ray analysis; but for photography its main value is in making wedge-spectrograms to show the colour sensitivity of photographic emulsions. These project a spectrum through a density wedge on to the material being tested so that the colours are

recorded by intensities corresponding to the film's sensitivity to the colour (see page 1970). A prism can be used to produce the spectrum for a spectrogram but a diffraction grating is often preferred because it spreads the colours evenly throughout the spectrogram—the prism spreads out violet and blue more than red.

Aperture effects

Perhaps the most significant photographic effects of diffraction concern the aperture diaphragm of the



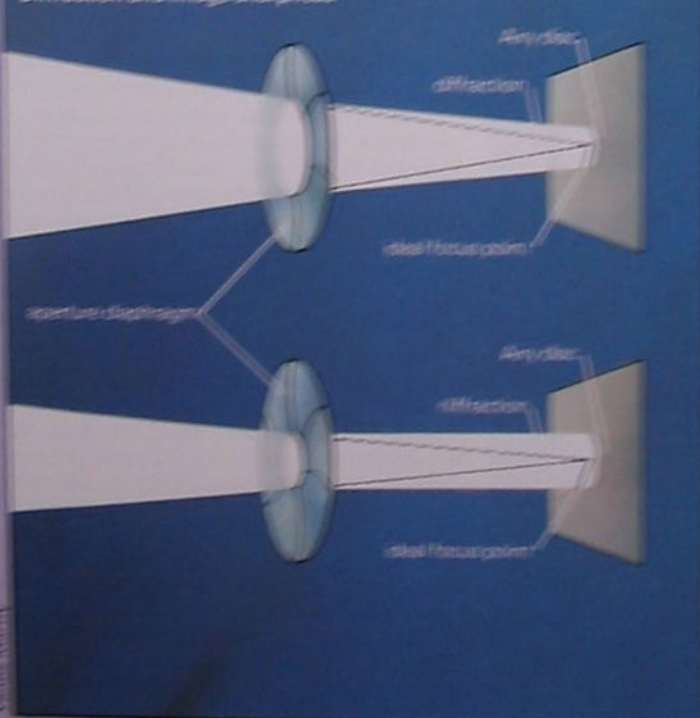
© Stuart Wilson

How an edge affects light waves



© Venus Maffly

Diffraction and image sharpness



© Venus Maffly

Diffraction: Spreading of light waves behind an edge gives secondary wave circle

camera lens. The edges of aperture blades diffract light coming into the lens in the same way as any other edge.

When the light from a single point in the scene is focused on the film, the image is not a single point but a smudge of light called a disc of light by diffraction from the edge of the aperture, even in a lens totally free from aberration. This disc is known as the *Airy disc*, after the astronomer who discovered it in 1838 (P. B. Airy) and is surrounded by a set of rings of decreasing intensity—the *diffraction rings*.

It is the Airy disc that effectively controls the maximum resolution in a lens free from aberration. The smaller the disc, the finer detail a lens can resolve

because large discs will overlap and blur the image. In a lens in which lens resolution is limited only by diffraction, not aberration—a diffraction limited lens—the size of the disc can be calculated accurately for the average wavelength. From this figure the resolution can easily be worked out—it is simply the number of discs of appropriate size that will fit into a given length.

Clearly, the effect of diffraction varies with the aperture. At very small apertures, a large proportion of the light passing through the lens is affected by diffraction and the Airy disc is therefore much larger. This means that resolution is virtually reduced as you stop down. Fortunately, this effect is not really noticeable at most taking apertures, but it is the reason why few lenses go down beyond f/22.



World of photography

Brian Brake

The eye for a picture that New Zealand photographer Brian Brake developed while still a young schoolboy now helps him on assignments for leading magazines and publishers throughout the world

For the few photographers talented enough to be chosen, an invitation to join the highly prestigious Magnum picture agency is usually an accolade given to an already successful career. But when Brian Brake was invited to join Magnum in 1954, he was 27 years old, short of money, far from home, and had little published work. In addition, he saw

Indian farmer This fine portrait formed part of Brake's outstanding photoessay on India's monsoon season, which was published worldwide

Durgapur steelworks By choosing his angle of view very carefully, Brake has made a striking composition from a comparatively dull subject



himself at the time primarily as a film maker rather than a still photographer.

Joining Magnum was in some ways a return to skills he had developed in his youth. Raised in South Island, New Zealand, Brake's interest in photography had been awakened by a helpful park ranger. During his school holidays, he helped while the ranger photographed the wildlife and scenery around the rugged Arthur's Pass area in the Southern Alps, using glass plates and ageing wooden field cameras. By the time he was 11, Brake had learned how to use an 11 x 14 inch plate camera. He could also process and print his pictures, hand colour glass transparencies, and put together an entertaining illustrated lecture for presentation in the local railway workers' hall. Most important of all, he had cultivated an eye for a striking picture.

As a teenager, Brake used photography as an emotional crutch to help him cope with the death of his mother, and for a while he led a virtually solitary



life producing pictures in the pictorial style that was then (and still is) popular with camera clubs and amateur photographic societies. But when Brake left school to make his way in the world, he was immediately confronted with a different type of photographic challenge. He took a job as an assistant to Spencer Digby, a Wellington portrait photographer. For the first time in his life, he was concentrating on taking pictures of people.

Looking back on those early years, Brake regards his education in studio techniques as invaluable, even though an assistant's life is often tedious and repetitive. 'Digby wouldn't let you use a light meter in the studio,' Brake recalls. 'He'd say, "You've got eyes—use them."'

In those days, studio lighting meant large continuous-source tungsten lamps that allowed minute control of lighting effects. Even now, despite the almost universal use of electronic studio flash, Brake still prefers to use tungsten lights for all his studio work.

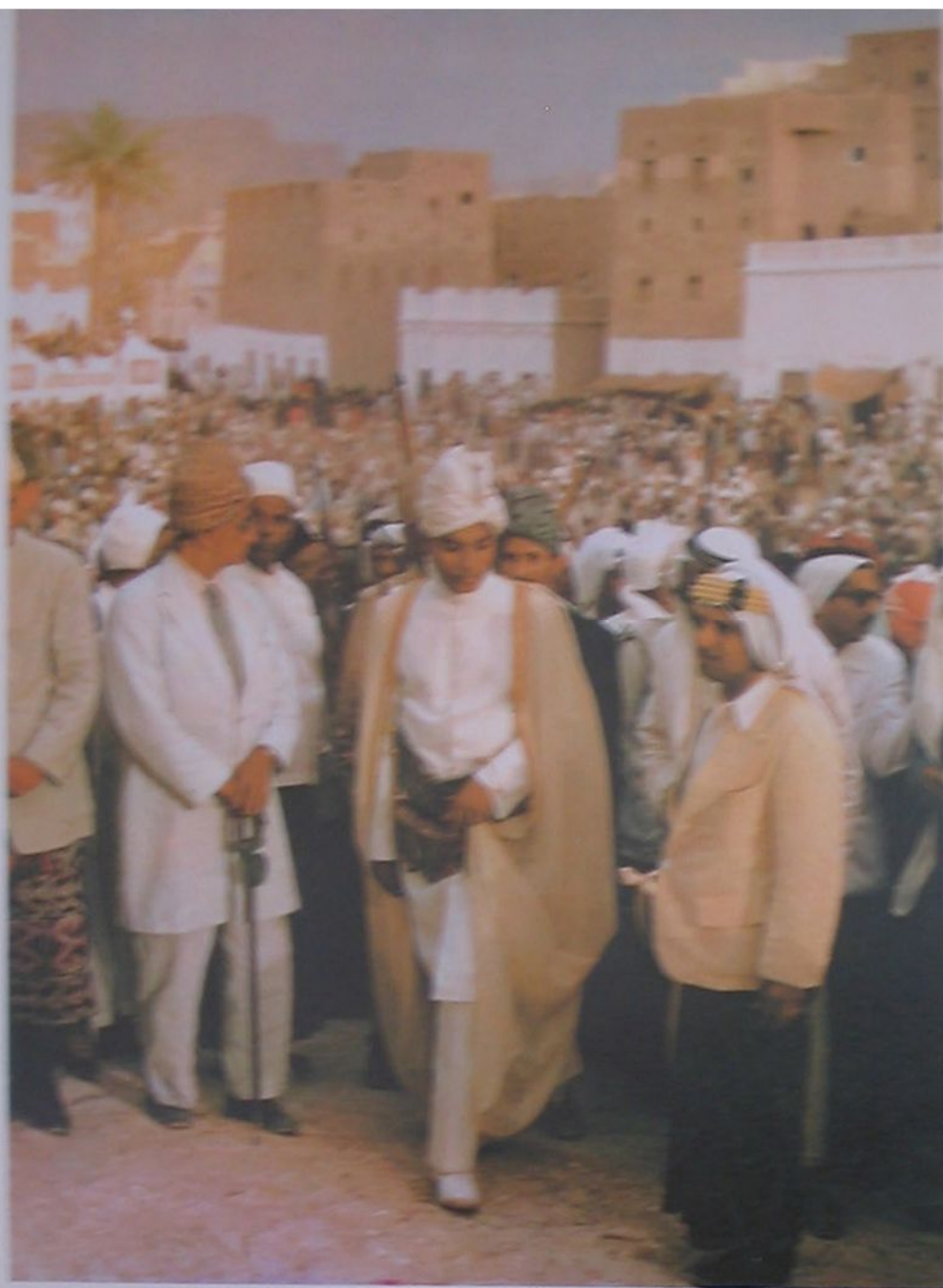
The most important lesson Brake learned in five years of portrait photography was how to reveal character by the subtle use of light and camera angle. The prospect of spending the rest of his life taking pictures of parliamentarians and socialites lacked appeal, however, so in 1950 he joined the New Zealand National Film Unit. At the time, the National Film Unit had a worldwide reputation for its innovative documentaries and promotional films, and the training that Brake received was first-rate. He made rapid progress, and before long he was editing and directing his own films. The National Film Unit had excellent facilities and was well-funded, but unfortunately it was also answerable to the government. Although he managed to turn out some fine work, Brake ultimately found the bureaucratic restrictions imposed from outside the unit too oppressive. He decided to pack his bags and head for London, hoping like many other Commonwealth citizens in the drab 1950s to find success there.

Included in his travel kit was a Leica screw thread rangefinder camera.

It was the Leica that led Brake directly to his new career. He had expected to find work in the British film industry, but he found that the difficulties were greater than he had bargained for. Without a union card, there was little he could do but wait for a lucky break. While he waited, he filled in time by shooting candid portraits on the streets of London, more for his own satisfaction than for any other reason. The Leica, so different from the large plate and studio cameras he had learned his craft with, turned out to be ideal for street pictures. Gradually he assembled a portfolio comprised of these pictures and his earlier scenic pictures from the South Island.

Eventually his Leica needed servicing. Although short of money, Brake decided to have it overhauled at the Leitz factory in Wetzlar, Germany. He took his portfolio with him.

'Up until then, my main mistake had been in showing my pictures to other



photographers, instead of to people who might have bought them. Luckily, Serge Von Holbeck, who was head of the Leica school at the time, liked my pictures when I showed them to him. Von Holbeck liked Brake's pictures enough to commission him to do some work for the Leica magazine. At that time, many photographers still needed to be convinced that small 35 mm cameras were capable of producing high quality work, and Brake's pictures, with their high technical quality and their variety of subject matter, were excellent demonstrations of the power and versatility of Leica cameras.

Two photographers who did not need to be convinced of the usefulness of Leicas, however, were Ernst Haas and Henri Cartier-Bresson. Already famous in their fields, both men had been using 35 mm cameras for years and were members of the Magnum cooperative. They were also impressed by the examples of Brake's work that Von Holbeck showed them. Haas recognized similarities to his own intentions in Brake's earlier pictorial work, while Cartier-Bresson felt a similar affinity with

Arab dignitaries, Aden 1956 Brake used a wide angle lens here to take in and emphasize the Arabian setting

Akira Kurosawa, 1963 The famous Japanese film director portrayed against a still from one of his films

Brake's later street pictures. A meeting was arranged and Brake's work, including his contact sheets, was closely scrutinized. Shortly afterwards Brake was proposed for membership of Magnum.

Joining Magnum did not solve Brake's problems overnight. There was still much he had to learn, and many contacts he needed to establish. Fortunately, acting on the advice of other Magnum members, Brake soon offered his services to the British magazine *Illustrated*. This was one of the many picture magazines that flourished in the days before television took over as the public's main window on the world. *Illustrated* sent Brake on his first major assignment—to shoot a picture essay on the Soviet Union. The essay form came naturally to Brake—his experience in documentary film-making saw to that—

but he failed to pack the latter route for sending his pictures back to *Illustrated*. Unfortunately, the French weekly magazine *Paris Match* were also working on a picture story about Moscow, and their pictures reached the newsstands before *Illustrated's*. Although neither story was 'hard' news (depending for its value on its immediacy), Brake was sufficiently chastened by the experience to ensure that he has never missed a deadline since.

Illustrated were not too upset by the incident and continued to provide Brake with the most important single source of his assignments in Europe. However, feeling the competition of the numerous photojournalists in Europe at the time, including that of his fellow members at Magnum, Brake took the advice offered by Cornell Capa and wanted New York Assignments from *Life* and *National Geographic* soon followed.

Brake's association with *Life* led to the essay for which he is probably most famous—his photographic report on the Indian monsoon season.

Actually the idea of the monsoon story had been discussed many times by Magnum members. Originally suggested by Bob Capa, the project had been rejected again and again by the Magnum group as being impractically large and likely to be bedevilled by endless unforeseeable problems. In 1959 Brake himself proved the difficulty of the project by failing to produce a usable set of pictures on an initial attempt.





Kyoto, Japan An atmospheric portrayal of the annual ceremony at which candles are lit as offerings to the unknown dead of World War 2. **Girl on a swing** Taken during India's Festival of Swings for Brake's monsoon essay



The following year he tried again. Having experienced the problems already helped him to make better preparations. *Life*, though suspicious of the practicality of the project, finally decided to give their support. Cartier-Bresson gave a list of useful contacts. Gjon Mili discussed the possibility of using special electronic flash equipment in torrential downpours. Tedious research in the colonial records kept at the old India Office library in London helped in the planning of an itinerary that would keep Brake moving from one photographically likely spot to another when the rains set in. And correspondence with Kodak's Bombay office ensured that Brake's pictures, all shot on the original 10 ASA Kodachrome, would be processed promptly and flown back to him on location. Brake's trump card was a heartfelt love of Asia that he had developed during a number of visits over the years, and which remains with him to this day. He returned to India with a passionate determination to succeed where others had failed.

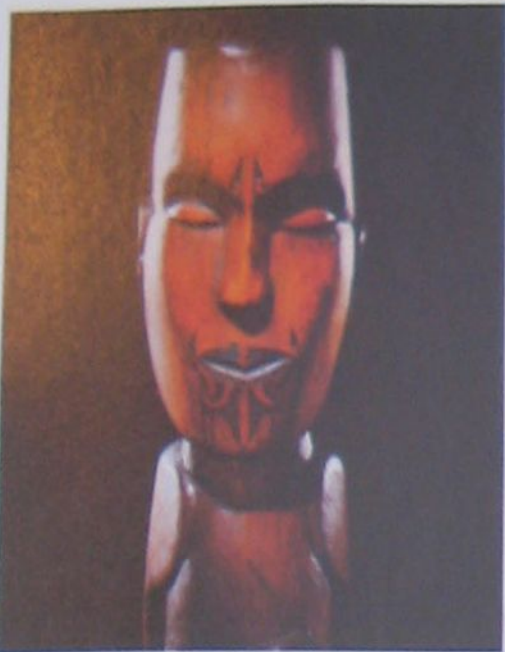
The task took five months. There were many set backs. The violence of the rain literally washed away his carefully planned itinerary. The electronic flash equipment, which he had hoped would enable him to stop raindrops in mid fall,

Chinese mobiles *This picture was taken on one of Brake's earliest visits to China, in 1957*

Cheerleader, Japan, 1964 *Caught at a high point of enthusiasm during a vast gathering in one of Japan's stadiums*

Brian Brake/The John Hillelson Agency





failed to live up to his expectations. Aerial photography was prohibited by the Indian government, so he had to make repeated trips backwards and forward on commercial flights, surreptitiously sneaking occasional shots from the windows of a DC3.

But there were plenty of successes. The most useful piece of advance preparation turned out to be Cartier-Bresson's list of contacts. Brake found the advice of Indian film director Satyajit Ray to be particularly useful. After he showed his initial pictures to Ray and his friends, they suggested other places and people that Brake could photograph which would follow up various themes

Maori carving A beautifully lit statuette photographed for Brake's book on the art of the Pacific islanders

Fiery glow Using the reflection of this steel furnace as the only light source has created a dramatic effect

evident at the start. Eventually he had enough material and he returned to Europe to make his initial selection of pictures. His underlying theme was the cyclic rhythm of the monsoon, showing how the annual rains refreshed the arid country, and he organized his 'take' accordingly. Other magazines wanted to publish his pictures virtually simultaneously with *Life*, so 4 x 5 inch duplicate transparencies had to be prepared in Paris. One vital 35 mm slide was accidentally torn in half by the dupe makers, and a retouched 10 x 8 duplicate had to be produced. Finally, after editing, about 100 pictures were offered for publication and the story ran in *Life*, *Paris Match*, *Epoch* and *Queen* in 1961. It won Brake an award from the American Society of Magazine Photographers and was later shown at New York's Museum of Modern Art.

Brake feels that if he had to choose a favourite of all his pictures, it would probably be that of an old farmer waiting for the rains that he took as part of the essay. Its combination of qualities typifies his style of photography, being a documentary portrait that gains impact from its strong pictorial qualities.

Brake went on to do other major essays for *Life* on the Roman empire, Egypt and Japan. But time passed and his focus shifted away from straightforward pictures of people to the architecture and artefacts of past and present civilizations. Eventually the decline in large-scale photojournalism led Brake to leave Magnum so that he could concentrate on photographing pictorially pleasing but less newsworthy subjects.

For a time he lived in Hong Kong where he set up a documentary film-making company and while there he did the photographs for a *Time Life* book on the colony. But in 1976 he returned to New Zealand and resumed still photography. From his home in the wooded hills to the west of Auckland, he journeys out on commissions to shoot company reports in Asia and the Pacific, or to photograph Polynesian carvings, most notably for a recent book on the art of the South Pacific. He still works as he has for years, carefully and with great sympathy for his subjects, whether they are villagers or artefacts.

Brake also continues to use Leicas. He travels with two Leica M4 rangefinder cameras, two Leicaflex SLRs and lenses ranging from a 19 mm to an 180 mm. He prefers whenever possible to use Kodachrome 64 film for colour and Ilford FP4 and HP5 when shooting in black and white. However, for still lifes he uses a Linhof Kardan B 4 x 5 inch camera.

Brake considers that the main qualities needed by a photographer wishing to emulate his success are the ability to follow a brief, technical skill, self criticism, a talent for self-projection, good relationships with magazine editors, and plenty of hard work. Also, a good eye. It is Brake's eye that has made him one of the most respected figures in post-war photography.



Washers and dryers

Print washing and drying can be made considerably simpler if you use equipment designed to ease the chore of the processes. But what you buy depends on which type of print paper you most frequently use

Print washing and drying processes are among the duller and most time consuming of darkroom chores. And yet these tasks, which simply involve either holding prints under a running tap or fanning them in the air, are of vital importance to the final quality of the images you produce. However, much of the tedium and the time spent can be considerably reduced if you buy washing and drying equipment to do these jobs for you.

The range of products available for washing and drying prints is extensive, and your choice of equipment will depend on how much printing you do, the facilities in your darkroom and the size of your budget. If you print only the odd frame or two at infrequent intervals, then even the smallest outlay might seem an unnecessary expense. But if you frequently print 20 or 36 frames at a time washing and drying equipment will soon pay for itself—but it must be chosen carefully if it is to be put to best use and be economical.

Few amateurs have a darkroom with running water, where a washer can be set up permanently. And unless you have a spacious bathroom or kitchen where you can do this, you will have to choose equipment that can be set up and dismantled easily and quickly. Space is less of a problem for print dryers. A corner in any room with a power point will suffice, but it should not be too far from the darkroom or you will probably end up spilling chemicals while moving between rooms.

One other factor that will affect your choice of equipment is the type of paper you usually use. Many photographic papers—both colour and black and white—are made with a resin-coated base, which is covered on both sides by a thin layer of polythene to prevent it absorbing water and chemicals. Resin-coated papers can, therefore, be processed, washed and dried much quicker than traditional papers in which the paper base soaks up the solutions. But it is not sufficient just to leave resin-coated papers immersed with a minimum of stirring; rapid water flow or stirring in chemical-free water is essential for rapid washing, whereas with traditional papers it is the length of time that the paper spends in the water that is more important for proper washing.



Overflow devices, placed in the plug hole of a sink or bath, are the simplest and cheapest means of washing prints on any type of paper

Overflows and syphons

For fibre-based paper, which requires little stirring, the simplest and least expensive print washing device consists of an overflow tube placed in the water outlet or plug hole of a sink or bath so that it protrudes upwards. It maintains a constant head of water into which the prints to be washed are immersed while the tap flows.

Such a device has a flow rate limited by the size of the outlet. It is also possible for a print or small test strip to wrap itself round the outlet, covering the holes and risking an overflow.

One variation on the overflow principle consists of a tube within a tube, both being jointed at the lower ends. Water from the tap enters the inner tube and jets through holes at the base into the sink or bath. The jets of water cause turbulence, which stirs the water and washes the prints effectively.

High speed washers, intended for resin-coated papers, provide a rapid flow of water over both surfaces of the prints, and are compact



A constant water level can also be maintained with a simple syphon. This is a U-shaped tube that clips on to the side of a print dish or other container. The short curved end dips in the water and the straight end hangs outside and over the water outlet. Such a syphon is simple and inexpensive, but it has the disadvantage of changing the water in the sink or container at a slow rate.

A much more sophisticated device is the autosyphon. It costs about the same as a roll of Kodachrome and functions either as a simple overflow or as a syphon. Overflow action is achieved by removing the outer dome of the device, leaving an inner pipe which maintains a constant level. With the dome fitted, water rises to the height of the device and the syphon action drains the water to a lower level. The level rises again and the process is repeated. In this way the water is changed constantly.

Only a small number of prints can be washed conveniently in a sink without having them overlapping and adhering to each other. And the sink cannot be used for any other purpose while the prints are being washed. So although overflow devices are least expensive, they might not be suitable for amateurs working in small, improvised darkrooms or kitchens. Under such conditions, an automatic print washer could be better.

Auto washers

A basic auto print washer costs less than 200 sheers of black and white A4 paper. It has a large capacity yet can be placed on a draining board or in the sink itself with plenty of room to spare.

Essentially, the auto washer is a tank fitted with an inlet and an overflow. Each print is placed vertically in separate compartments of a cradle, which slots inside the tank. Automation is achieved by a thrust mechanism driven by the force of inflowing water. This rocks the cradle so that water flows freely over both surfaces of each print. The rocking action can be stopped to insert or remove prints, and the cradle can be

lifted clear of the water by a handle at each end.

The water flow is so efficient that the washer is suitable for resin-coated paper, although it is designed primarily for fibre-based paper. But its main advantage is that a standard model can hold 12 prints up to 24 x 30 cm or 24 prints measuring 13 x 18 cm or smaller. Larger models hold similar numbers of larger prints, and have a built-in syphon to empty the tank after use. Cheaper units are available which lack the rocking device, but which may take larger paper sizes.

The main differences between the various makes of similar washers are the volume of the tank, and the size and number of prints they can take. Near the top of the range, Kindermann make a couple of wash tanks that are suitable for the professional darkroom or the larger-budget amateur workshop. The smaller model measures 40 x 40 cm and costs about the same as a budget SLR. The larger model costs twice as much and measures 50 x 50 cm.

High speed washers

To utilize the rapid processing property of resin-coated paper, manufacturers have designed a range of high speed washers. In order to wash in a short time it is essential that chemical-free water flows rapidly over both surfaces of the prints. A typical high speed washer consists essentially of a tray with an inlet hose connected to the tap. The base of the tray is ridged so that water can flow over the under surface as well as the upper surface of the print and out through a drain hose at the other end of the tray. The prints are separated by pegs, which can be inserted into various holes in the base of the tray. These can be arranged for prints of two different sizes, or removed altogether to accommodate a single large print.

The capacity of the tray is four, two or one—depending on the size of print. This might seem small but, in fact, it is adequate for most amateurs when you



Double sided glazer This gives either a glazed or a matt finish to prints on fibre-based paper, and ensures they dry without wrinkles or curled-up edges

consider that the device washes resin-coated paper in just two to four minutes, compared with five minutes for the auto washer and 30 minutes for fibre-based paper in an ordinary washer.

Drying the prints

As with the washing process, the arrangement for drying prints can vary enormously. It is not unusual to remove excess water from prints and lay them flat in a dust-free atmosphere to dry. They dry even quicker if placed on blotting paper. Left like this, a print on resin-coated paper dries in about ten minutes, but fibre-based paper takes much longer—usually more than an hour. Many amateurs dry both types of paper even quicker by playing warm air from a hair dryer over the surfaces.

Besides its quick-drying property,



An auto washer (left) has a rocking action, which causes water to pass rapidly over both surfaces of prints stacked vertically in a plastic cradle. Water flow causes the rocking

Rotary glazer This employs a rotary metal cylinder and a motorized canvas loop to give high throughput of prints on fibre-based paper up to about 50 cm wide

Equipment courtesy of De Vere Ltd





Auto dryer A
thermostat and a speed control make fan-assisted, auto dryers particularly efficient for drying either fibre-based or resin-coated prints straight from the washer

Drying fibre-based paper

One of the major drawbacks with fibre-based paper is that it must be kept flat during drying. The most common way to do this is to hold the print against a flat or slightly curved surface using an absorbent blanket; heat is applied through the metal surface.

The most elementary dryers for fibre-based papers are of the flat-bed variety. These have a double-sided metal bed containing heating elements, over which

resin-coated paper has another important advantage—it dries without curling, unlike fibre-based paper. So prints can be placed vertically to aid drying. An ideal piece of equipment for such prints is a drying rack. One model has five compartments, with separators that have small pips to ensure minimum contact with the prints. The design is compact, requiring little room. And two or more racks can be combined to increase capacity. Costing about the same as three rolls of Kodachrome each, this type of purpose-built rack would be worthwhile if you print large numbers of frames at once.

A print squeegee is a useful aid for drying resin-coated paper naturally. This is a tweezer-like device with soft rubber blades that squeeze excess water evenly from both sides of the print. The design ensures that you cannot damage the prints by applying too much force to the blades. Without the use of a squeegee, resin-coated paper would take much longer to dry.

The squeegee is incorporated in print drying machines that can produce completely dry prints in a matter of seconds. But instead of a pair of blades, these employ a pair of rollers. Usually, one roller is made of rubber, and the other is made of an absorbent material. A wet print straight from the wash tank can be fed between the rollers to be squeezed evenly before being dried.

Heat assisted dryers

Lower-priced dryers for resin-coated paper are operated manually by turning a handle, which deposits the damp print into the drying compartment. You can choose between a warm air or an infrared type of dryer. The range is extensive and the amount you pay depends on the facilities provided, as well as the size and speed of the dryers. Whatever the

Manual dryer
Operated by hand and intended for RC paper, these are cheap and quite economical for the amateur who prints large numbers at once, and fit easily on a table-top

system, excess water must be wiped from the print before being dried, but this operation may be done separately. A completely automatic system with motorized conveyor, thermostat and speed control, drip tray, print tray and heating element can cost more than a good SLR. But professional studio dryers can cost about as much as a typical top-range camera such as a Leica. The drying rate depends on the power rating of the heater element and motor speed.

Warm air dryers consist basically of an electrical heating element over which air is blown by an electric fan. The heat is controlled thermostatically, and the warm air is channelled over the surfaces of the prints in a drying compartment. Once in the compartment, a timer is set to stop the process after the drying time has elapsed. Some automatic machines have speed and temperature controls. The speed control varies the time taken for the prints to pass through the drying chamber. Using both controls, almost any type of material can be dried either in a few seconds or over any extended period. Infrared dryers are similarly arranged but they heat the prints directly by a radiating element.

All these dryers are designed for use with resin-coated papers. They will work with fibre-based paper, but the results are likely to be less satisfactory, producing prints with crinkled edges.



David King equipment courtesy of De Vere Ltd.

the absorbent blankets are stretched. The more expensive units have thermostats. Prints are dried in these units within 10 minutes particularly if they are squeegeed first.

It is important to place the print with its emulsion facing the blanket—otherwise it will probably stick to the hot metal. If the prints are to be glazed, however, they must be held with the emulsion towards a highly polished metal plate, which is an optional extra.

Most amateurs will be content with a flat-bed dryer, but they do have the disadvantage of a slow drying rate. You can only dry two A4 sheets per side on the smaller sizes, which means that you can dry 24 prints in an hour. If you produce large numbers of prints you may need to use a rotary glazer, which consists of a large glazed drum in contact with a continuous blanket loop. The drum rotates at a variable rate and is usually equipped with a thermostat. Throughput can be as high as several hundred prints per hour. Typically, a rotary glazer capable of drying 40 x 50 mm prints is large and weighs more than 40 kg.

All dryers for fibre-based papers have some disadvantages: both blanket and glazing sheets can become stained, and must be used with care; they are not suitable for drying resin-coated papers, unless the working temperature can be reduced to 90°C, or less.

What went wrong?

Flower power

Flower pictures are often attractive, but they need care to make them really powerful. Colin Molyneux gives constructive criticism of three very different pictures



This picture is not simple enough. The background is distracting and the large leaves give the whole picture a lack of balance. The flower on the right is a rather ragged example and would have been better left out.

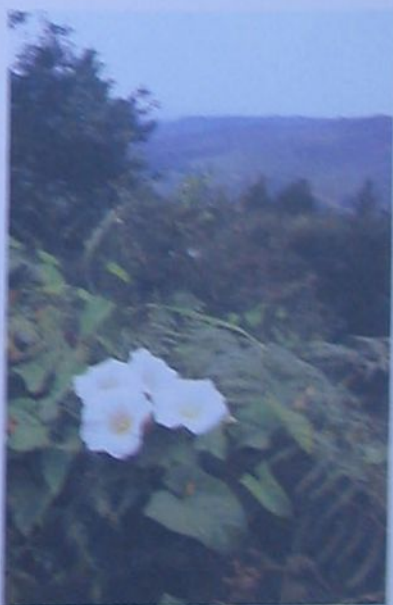
A point worth watching in these circumstances is the effect of the f-stop used on the background—check the background with the help of the depth of field preview button, as viewing the subject with the lens wide open tends to minimize it. But when the lens stops down to the taking aperture, the background can become very obtrusive. In this case, I would have moved in a little to place the centre flower over the blue hole in the background, as this area of light tone and colour tends to distract the eye from the main subject.

In general, therefore, I would have moved in much closer to the two centre flowers, concentrating the composition around them and cutting out most of the background, which contributes very little to the picture. You do not need close-up equipment to be able to do this.



The most interesting feature of this photograph, the flower with the water droplet, has lost its impact by being too small within the frame, and by being surrounded by a confusion of out of focus background detail. The stalk that passes diagonally behind the flower is particularly disturbing, as it upsets the general left to right flow of the picture, as well as distracting from the main subject. If changing position was not possible, then I would have moved the offending stalk out of view. Large spring clips come in handy for this and can be used to hold stalks and foliage temporarily out of frame without damaging them. Alternatively, always carry a few short lengths of string with you—then you can tie bits and pieces out of the way.

My approach would have been to move in really close and isolate the flower against a plain dark area of background, simplifying stalks and concentrating on the flower and water droplets. I would also have made use of the depth of field preview, with which many modern SLRs are fitted, as this also helps reveal whether the background to the main subject will spoil the picture regardless of it appearing in, or out, of focus. In this respect the preview button can be used as a valuable compositional aid and should prevent mistakes of this nature.



Here, the photographer has tried, and with some success, to show the flowers in relation to their setting. Of the three, this picture is, to my mind, the most successful. Diffused lighting helps keep the contrast between the white flowers and the foliage within reasonable limits. To balance things up, I would have moved the flowers more to the right in the shot, leaving the dark bush where it is, making more of the existing diagonal and helping produce a much stronger composition.





Photo-reportage

Reportage photography is not the exclusive province of professionals—many excellent images can be produced at small, local events, and this is where the amateur can be at an advantage

The term *reportage* can apply to many photographic situations, from covering a war to photographing the local flower show. It can mean hard news photography, or gentle pictures of an exotic country for a travel magazine. What distinguishes reportage from other branches of photography is that it deals with facts at current events—anything, in fact, which could be published in a newspaper or magazine.

For most people though, reportage means photojournalism in its strictest sense—seizing a significant moment or series of moments, to give accurate coverage to an event. This need not be the privilege of professional news photographers. Anybody can photograph public events of all kinds, and no event is too insignificant to warrant coverage. Indeed, smaller, local events are more likely to furnish you with original shots, simply because your work is less likely to be swamped by hundreds of similar pictures.

With any kind of photo-reportage, pre-

Falklands crisis. A fish-eye group portrait created an unusual image out of an event in danger of being 'overworked' by press photographers

paration is of fundamental importance. This applies as much to fast-moving, unpredictable events as to more leisurely ones. Thus it is important to have the right camera ready, with the right lens fitted, when you are photographing a football match, but planning is just as important if you are photographing, say, a demonstration which lasts three hours. In either case, preparation would involve selecting your viewpoints in advance, if possible.

If, for example, you decide to cover a protest march, it is a good idea to find out what the route of the march will be, and locate suitable vantage points from which to shoot. Bridges or high ground both offer places from which to take panoramic or overall shots with a telephoto lens. Any raised viewpoint can give you a more effective shot—

compressed perspective allows you to fill the photograph with a sea of faces and banners.

You can also try to find out what is going to happen at the end of the march—there may be speeches, or street theatre, or a petition may be handed in. All of these offer chances for a creative shot.

If you are photographing a politician making a speech, try to capture angles other than the straightforward head and shoulder shot. By shooting from behind with a wide angle lens, you could include some of the faces in the crowd. If you cannot get close enough for this, try taking a silhouette of the head and shoulders from below—a 'crowd's eye' view.

Some famous news shots have been taken of speeches by including not just the politician but also other members of the group on stage, in attitudes of either agreement or discord. The picture can be made much more significant if some other element, reinforcing attitudes



Air crash Shots like this are mainly a matter of luck, but it still takes skill to overcome your emotional response to produce a photograph that communicates the horror and tragedy to others

Riot patrol Careful choice of viewpoint generated maximum impact from this tense scene. The side view leads the eye into the picture, offering an involved glimpse of the determination of the patrol



towards the politician, can be included.

Amateur photographers will often find it difficult to get close to the action, because they do not have official press credentials. This is where you must use your resourcefulness and initiative to catch interesting shots. Instead of looking for shots of the centre of the action, look at the crowd—there will be interesting subjects on the fringe. Some may be wearing interesting clothes, or there may be marching bands or impromptu street theatre.

Details and incidental events can also make good photographs. A marcher might be carrying a sleeping child, or someone might take off their boots to rest their feet, or jump into a fountain to keep cool. All details like this give an original look at any event, and are refreshingly different from the usual news coverage.

When the event you are covering is also being photographed by the media, it is worth buying newspapers or magazines and comparing their results

with your own. Try to spot what aspects they have covered that you failed to cover, and assess whether their pictures are more effective than yours.

As an amateur, you actually have an advantage over professional photographers in a sense—they have to produce their work to a deadline, while you are free to stay on the scene after the pressmen have had to leave. Often, interesting things happen at the end, and you will be able to capture these.

There is no need to stick to major events of national significance in your reportage. No event is too small, and you can be just as creative covering local functions. By looking at your local paper, you can easily find out about scheduled events—a village fair, a scout meeting or a pensioners' swimming club marathon all offer excellent opportunities for reportage. Their organizers will be only too keen to have photographic coverage, and you will probably need no press pass whatsoever.

Liaison-Gamma/Frank Spooner Pictures



David Simson

Head-on view This shot includes all the main elements, but the viewpoint fails to create impact or pinpoint a centre of interest—mainly because the guards are not facing the camera



David Simson

Breaking up a demonstration Even without time to observe rules of composition the photojournalist has to develop an instinct for concentrating on a main subject—here the old lady—and relating it to the main event

Tim Malvon



The local paper may be interested to see good pictures taken at these events, since they cannot send their own staff to cover them all. But bear in mind that even at the low rates paid by the small newspapers, they are not likely to use one of your pictures unless it is particularly good. This is where it helps to look at pictures used in the major papers to see popular styles.

In this kind of small event, the best photographs are not necessarily obtained by adopting the straight-forward documentary approach. You may well produce more successful pictures by setting up shots—at a small function, you can often intervene at the end for posed shots. For example, at a sporting event, the weightlifters would only perform individually, and you could only photograph them one by one. By waiting until the end and photographing them as a group you could photograph their assembled bulk, giving a much more powerful and better idea of their

power than you otherwise could.

When you set up a group picture, you should have a clear idea of what you want beforehand, and set the shot up quickly and in a businesslike fashion. If you hesitate, chaos will reign as the various participants try to strike the right attitude, or shuffle about in embarrassment waiting for direction.

Another important point to bear in mind is that a posed photograph should tell something about the people in it. It is no use lining up a group of people and snapping away. Pose them in appropriate attitudes, if possible against a relevant background, and break up the line of bodies. More important people in the group should be positioned in such a way that they appear to be more important. It does not matter if the photograph looks posed—it should above all be interesting and informative.

Another way of showing interesting aspects of a smaller event is to concentrate on detail in a way which

would be very difficult with a larger event. Obviously things to concentrate on at a sports event are hands or faces. The bent arm of a shot putter at the moment of maximum effort, or the expressions of pain on the faces of runners are cases in point. And do not forget that the expression of triumph mingled with pain on the face of a winner tells a very powerful story.

Your pictures will be useless as far as sales are concerned if you do not make copious notes about who you have photographed. Your memory will probably let you down, and nothing annoys local papers more than readers phoning in to complain that the caption spelt their name wrong. You will not be trusted as a contributor again if this happens.

A good reportage photograph has to tell the viewer as much as possible without becoming confused or cluttered. This is not always easy to do, if only because you are not always at liberty to choose what goes into your picture and

what gets left out. Wide angle lenses allow you to juxtapose extra elements with your main subject, giving added information. With a fast moving event, it is difficult to control this, but with a portrait session, for example, you can do quite a lot in this direction. If you are photographing a local author, you can place him against a background relevant to his work. The leader of an environmental group, for example, might be photographed against the background of a motorway—this would add to the picture without making it too cluttered.

News photography usually uses the most simple techniques because the pictures have to be taken in a hurry. Working at a more leisurely pace, you have all the time in the world to experiment and elaborate your own individual approach to a subject. For example, you could use blur creatively, to form your own subjective images. Someone making a violent speech could



Tanker disaster The stricken oil tanker and the man cleaning the polluted beach combine to tell the whole story



Crowd in protest Shots of large crowds often look very impressive through the lens, but the finished print usually lacks a central point of interest to draw the eye. The photograph ends up being more of a visual pattern than what a photojournalist has to be primarily concerned with—showing what is going on and who is involved

Closer view This more selective view provides much more detailed information—a circular banner in the upper part of the frame complementing the peace symbol lower down. The faces of some of the people involved are also clearly visible, creating more human interest and describing the scene more clearly



Jeremy Nicholl/City Limits

Mark Rutherford/City Limits



Riot The figures silhouetted in the foreground add an extra element in this photograph of urban unrest

Lauréat Maous/Gamma/Frank Spooner Pictures

be photographed with waving arms blurred, giving an effective image which would not be acceptable in a newspaper for example—though it might be suitable for a magazine.

Another possible use of blur might, for example, be to show the effect of heavy lorries on a small village. You could photograph a passing truck at twilight with a powerful flashgun, then use a long hand held exposure to blur the surrounding houses, giving a striking impression of the destructive vibrations.

All special techniques should be used with caution—if you overdo them, you may not only produce photographs of doubtful taste, but you might well distract the viewer from the primary object of the photograph, which is to provide information. Furthermore, the more use you make of special techniques, the higher the failure rate will be for a given number of shots. This is because blurring and other types of action photography are usually just

impossible to control. The only solution to this is to do what press photographers do—shoot a large number of frames.

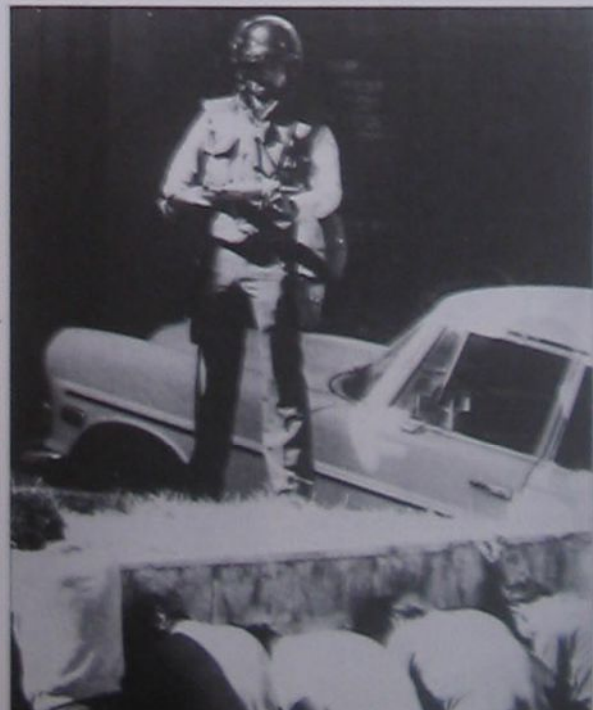
A final and important point about reportage photography is the question of objectivity. Your reportage shots are supposed to show what actually happened at an event. In practice, by selecting any given moment in an event, you are presenting your own picture of it, and your selection of photographs will be a subjective, not an objective view. Even by cropping a photograph you can make it tell a different story. So reportage is never completely objective—there is nothing you can do about this. But you can be aware of the selective nature of photography, and select your pictures in such a way as to give as balanced a view as possible of what happened. If you give careful thought to your images, there is no reason why reportage should not prove to be a most rewarding branch of photography.



Joe Traver/Gamma-Liaison/Frank Spooner Pictures



Snow storm A severe bout of winter weather may be of interest by itself but a more newsworthy picture has been taken by including a human element—these residents of Buffalo, New York coping with the snowfall. The inclusion of figures also adds a sense of scale and tells just how deep the snow really is



El Salvador demonstration The photographer had enough time to think about his shot so that he could compose it to show both sides involved in a bitter conflict—crouching prisoners in the foreground bent in submission to the towering figure of authority standing above them

Jacob Sutton/Gamma/Frank Spooner Pictures

Aslak Aarhus/Gamma/Frank Spooner Pictures

Understanding...

Interference

When light waves from two directions meet, they 'interfere' with each other and this interference has a number of significant photographic effects

The rainbow fringes of colour that can sometimes be seen on soap bubbles, on oily roads after the rain or even on the wings of a fly caught in the sun, always seem elusive, slightly magical phenomena that have little to do with everyday photography. Yet they are all instances of an important optical effect called *interference* which has a number of significant implications for practical photography.

Interference, like diffraction (see page 2050), can be most easily understood by thinking of light as a series of waves, even though we know now that the nature of light is more complex than this. Indeed the phenomenon is called 'interference' precisely because it can be explained by a wave theory—interference occurs in many other wave patterns besides light such as radio waves and sound waves.

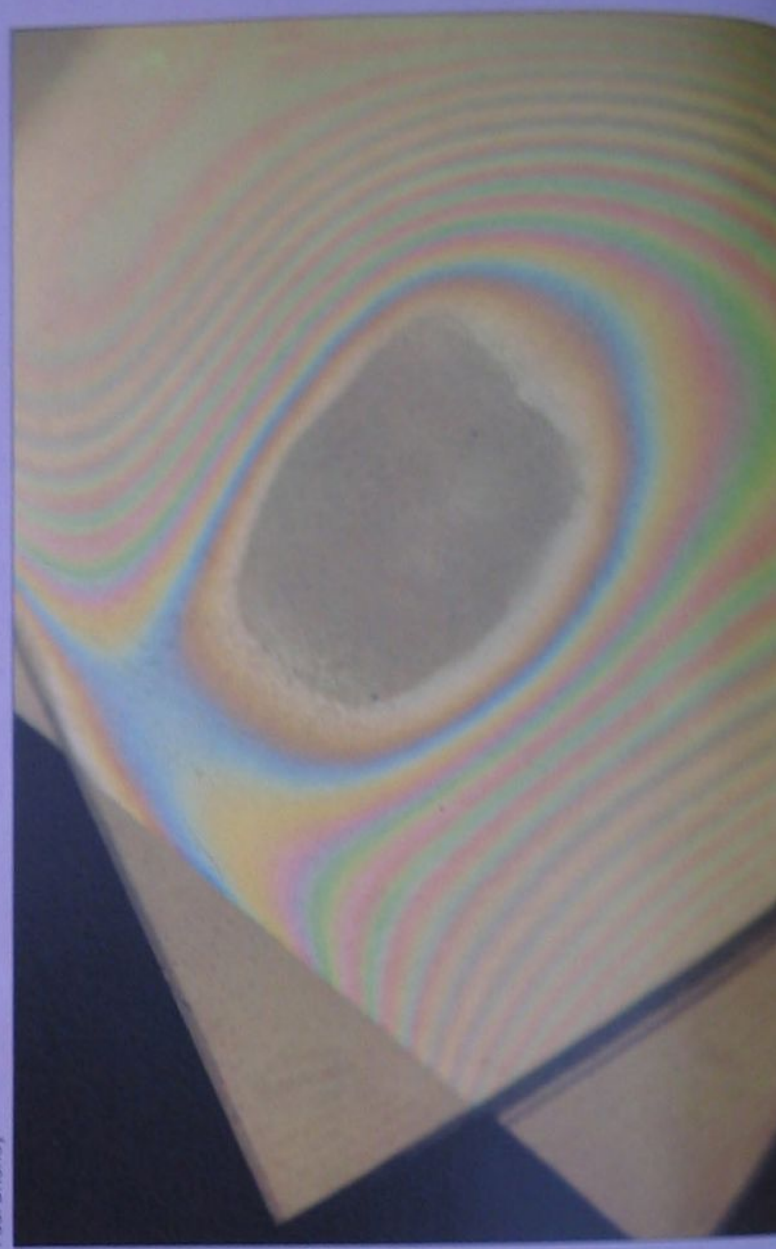
In any wave system, whether it is light waves or ripples on the surface of a pool, certain things happen when two waves meet. If the two waves meet trough to trough and crest to crest, then they combine to make one large wave. This is referred to as *constructive interference*. If, however, the trough in one wave meets a

crest in the other, the effect is that they cancel each other out, leaving no wave at all. This is *destructive interference*.

You can see this effect for yourself by throwing two stones into a pool a little way apart. Where the circles of ripples spreading over the water meet, the surface becomes marked by a series of sharp peaks where the crests meet, interspersed with becalmed areas where a crest crosses a trough.

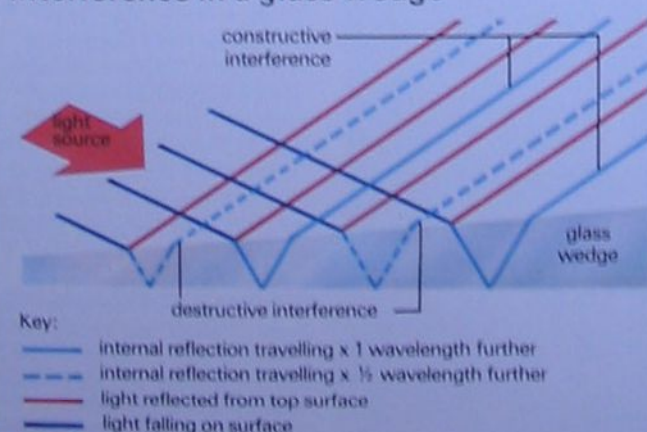
With light, when two series of waves or *wavetrains* meet so that all the crests coincide, they are said to be *in phase*. When wavetrains meet in phase, they interfere *constructively* to give a bright light. When wavetrains meet out of phase they interfere *destructively*, leaving no light at all. It is important to remember that these simple in phase and out of phase effects occur only with wavetrains of the same wavelength: where wavetrains of different wavelengths meet, the effects are much more complex.

Newton's rings Coloured fringes caused by interference between reflections from the surfaces of touching glass—the air gap is about a wavelength of light thick and acts like a wedge



Paul Brerley

Interference in a glass wedge



Interference fringes on a glass wedge occur because light reflected from the internal surface travels various distances farther than that from the top surface

Charlotte Styles

Clearly for two wavetrains to meet and for interference to take place, light must come from two different directions. Surprisingly, two different light sources will not usually produce an interference pattern. This is because most light sources emit light rather irregularly, sending out short, unrelated wavetrains at seemingly random intervals. This means that the waves from two lights may be in phase one moment, out of phase the next and sometimes may not coincide at all. These changes are so rapid that we cannot see them and we never appreciate that interference is taking place at all.

Most interference phenomena, therefore, are associated with a single light source. The light is split so that some of the light has to travel farther than the rest, producing a phase differ-

ence. But the important thing is that the pulses start and stop at the same time so the phase difference is always the same. Light like this is known as *coherent light*.

When Thomas Young conducted the first experiments to prove the existence of interference in 1805, he split the light by using two narrow slits. The semicircular diffraction pattern (see page 2051) beyond each slit meant that where the two circles overlapped an interference pattern was set up. This interference pattern was clearly visible on a screen. Where waves met crest to crest (in phase), they amplified each other giving a bright line on the screen. Where they met out of phase, they cancelled each other out producing a dark shadow on the screen. These alternating bars and shadows are known as *interference fringes*.

Alternatively, an interference pattern can be produced in a wedge of glass. When light hits a wedge of glass, some is reflected from the front surface and some is transmitted. When the transmitted light reaches the far side, again some is reflected and some transmitted. So when we look at the glass, we see some light reflected from the near surface and some from the far surface.

When light is reflected from the internal surface on the far side of the glass, it undergoes a phase change so that troughs are reflected as crests and vice versa. When this internally reflected light gets back to the front surface its wave pattern meets the wave pattern of light reflected directly from the front surface. Where the glass is $\frac{1}{4}$, $1\frac{1}{4}$, $2\frac{1}{4}$ and so on wavelengths thick, the wave crests of the internally reflected waves coincide with those of the front surface reflections. The two wave-trains are therefore in phase and interference is constructive. Where the glass is whole wavelengths thick, the wave-trains will meet out of phase and interference is destructive. Because the wedge increases in thickness gradually, this produces a series of dark and light interference fringes across the surface of the glass.

Normally, these interference fringes are virtually invisible to the naked eye in white light because white light is composed of many wavelengths of light and the interference patterns in one colour are cancelled out by those in another. However, when the separation between the two reflecting surfaces is about one wavelength thick, the interference patterns



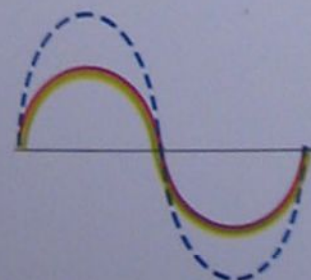
Bloom Interference between light reflected internally and externally is used in lens anti-reflection coatings

may be clearly visible. Because different colours have different wavelengths, some interfere constructively and others destructively. The result is a series of brightly coloured fringes with colours in a completely different order to those in the spectrum.

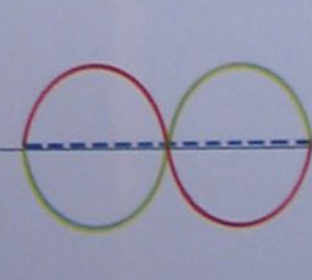
It is this effect that produces the colour patterns on soap bubbles because of reflections from the internal and external surfaces of the bubble. Similar fringes show in oil on water because oil usually spreads itself into a layer just one wavelength thick. But for the photographer, the most obvious instance is *Newton's rings*.

Interference When wavetrains meet crest to crest, they combine constructively to make one big wave; crest to trough, they cancel each other out (below). This creates patterns of dark and light (interference fringes) when the waves diffracted beyond a pair of narrow slits meet and interfere (right)

Constructive



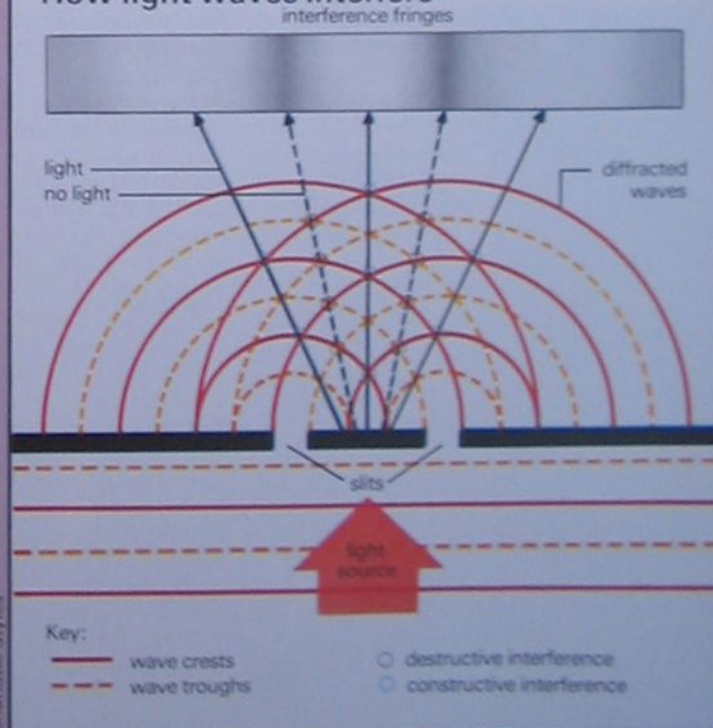
Destructive



Key:

- first wave pattern
- - - second wave pattern
- ... resultant

How light waves interfere



ness of the emulsion breaks up the interference pattern on this side. But such mounts are usually etched on both glasses to make them interchangeable.

Newton's rings may also be a problem in the darkroom because the negative touches the glass of the negative carrier—they show up clearly on the print. Glassless carriers are again the best solution, though glass ones may be used if the negative does not touch the glass and, in certain cases you can squeeze the negative on to glycerine on the glass to prevent the formation of air bubbles.

Although Newton's rings are beautiful to look at but a nuisance for the photographer, interference also has some positive uses. The most important example is in anti-reflection coatings for lenses (see page 714). Coatings exactly a quarter of a wavelength thick are spread on the glass surface of the lens so that light reflected from the surface of the glass interferes destructively with that reflected from the surface of the coating. Reflection of that wavelength is therefore almost completely cancelled out. By giving the lens a number of coatings with thicknesses corresponding to various wavelengths of light most of this unwanted reflection can be removed.



Improve your technique

Natural flash

Many amateurs use their flashguns only when it seems too dark for normal exposures. But you can use flash even in fairly bright conditions, to lighten shadows, improve colour and increase sharpness



David Parker

Flash is undoubtedly a valuable weapon in the photographer's armoury and in many circumstances it is the only way of achieving a picture. But many photographers will not use it because they feel it destroys the atmosphere of the available light, particularly natural daylight. However, used in the right way, flash can not only be used without upsetting the quality of the available light, it can positively enhance it, by controlling contrast, adding detail and improving colour and sharpness.

If you wish to retain the feeling of natural light but wish to use flash to fill in shadows in indoor shots, it is important that the use of flash should not be obvious in the picture. There are a number of ways of achieving this, but it is undoubtedly simplest to keep the flash light weaker than the available light.

Weak flash

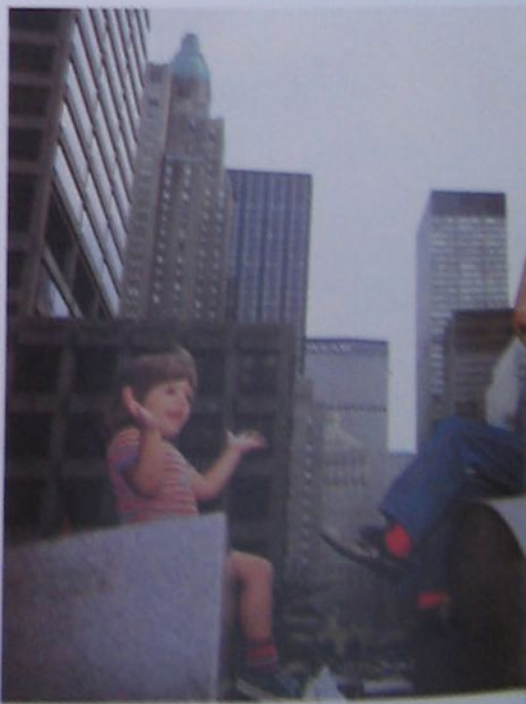
With an automatic flashgun the flash can be weakened quite simply by altering the settings. First set the aperture on the camera to give the correct exposure for

Sharp crosses Adding flash to the picture not only lightens the shadows, so giving a more reasonable contrast range, but also helps to make the image look sharper. This is because the flash 'freezes' any movement

the light available. Then set an aperture one stop larger on the flashgun dial. If the exposure for the available light is 1/30 second at $f/4$, then you could set the flashgun at $f/2.8$. This means that the flash will be too short to give a full exposure but is sufficient to lighten shadows.

Use a warm coloured filter such as an 81A to reduce the blue highlights produced by direct flash, and try to avoid the tell-tale shadows running back from the subject, either by having no close background, or else one which is so close that the shadows are too small to be noticed. You can either come in very close, so that the light source is effectively larger, or keep back a little, so that all the clues are smaller and so less noticeable.

When you wish to achieve a really subtle effect, you can increase the



Richard & Sally Greenhill

aperture setting on the flashgun by two or even three stops. Used like this, the flash will be almost imperceptible but it helps to introduce a little colour, shape and texture into shadow areas and lift the picture generally.

Subtle fill-in flash may also help to make your pictures look sharp because the flash is so brief. The flash exposure does not, therefore, suffer from even a trace of camera shake and this ultra sharp flash image helps to give the whole picture an extra crisp look, especially in hand-held shots.

Another application of weak fill-in flash is to reduce colour balance problems when using daylight film in fluorescent or tungsten lighting. Aim the flash at the important features of the subject so that even if the rest of the picture suffers from a slight colour cast, it may not be noticeable because the focal point is rendered in the true colours. With the flashgun set one stop larger than the camera, the use of flash may be undetectable.

If, for any photographs you wish the flash and available light to be equally balanced, beware of simply setting the flash for the same aperture setting as the available light exposure. This merely results in an overexposed picture. Where the flash duration is brief, it has little effect on the overall exposure. But once the flash exposure is one to one with the available light, it increases the amount of light in the picture considerably. The solution to this problem is simply to reduce the aperture on the camera by one stop.

Using the flash on a one to one basis will of course change the overall effect of the lighting quite considerably, but the existing light may well hold its own remarkably well. One reason for this is that backlighting is more obtrusive than front lighting, but the light from the flash, even when bounced, is usually more

frontal than the existing light. Indeed it is the lack of backlighting that often makes flash (on its own) such a limited form of lighting. If you mix flash with available light you can often make use of a window, a table lamp or any other bright source to provide some backlighting. Backlighting not only separates each part of the subject from the background, but puts highlights on to every flat surface, bringing out shape and texture and subtly increasing the tonal range.

Quality control

While the simplest way of keeping pictures taken with flash natural is to use a weak flash you can also control its quality so that it looks like available light. To do this, you have to imagine the natural lighting for your subject, and then use the flash to reproduce it. You need to estimate not only the size and power of the light source correctly, but also its distance and angle.

The size is important because the type of shadows, the size of the highlights and the graduation of tone between the two are controlled by the size of the light source. If you want to make light which, for instance, looks as if it comes from a window, then you need a light source the size of a window. This can usually be done quite simply by bouncing flash from a white wall. The patch of flash on the wall will tend to be the same size as a window. If there is no white wall in the right place, you can bounce the flash off a reflector. This can be either a proper studio reflector, a large white umbrella, or even a white bedsheet, a sheet of white paper or polystyrene, or just a couple of pages of newspaper taped together.

Remember that for bounced flash the autocell on the flashgun has to be pointing at the subject. With some flashguns this is awkward, especially when they are mounted on the camera. An ex-



Richard & Sally Greenhill

Backlighting In the shot above, the flash has played an important part in showing detail in the room. But the available light is still crucial—the light from the fire picks up detail in the face, and the light from the doorway helps to outline the figure and pick up texture in the floor. For the pictures below, it was important to keep the detail in the background, by careful choice of exposure time, to provide a setting for the children, who were in shadow (right) and so were lit almost entirely by flash in the final shot. There is very little mixing of flash and available light as each lights a different area of the subject



Richard & Sally Greenhill





cellent solution is to have the autocell mounted on the hot-shoe and the rest of the flashgun on the end of a lead, so that it can be held as you wish. Some flash units have autocells which can be unplugged and used in this way, others offer the autocells, or 'remote sensors' as they are also called, separately.

In the same way, when you bounce flash from the ceiling you are, in effect, mimicking strip lighting because the overall effect of many fluorescent tubes is to turn the whole ceiling into one large light source—bounce-flash from the ceiling does exactly the same.

If you use direct flash it looks artificial unless you can position it to imitate some naturally occurring light source. If you want to imitate direct sunlight with a flashgun, take it off the camera and position it above and to the side of the subject, pointing down at the same angle as the sun might be expected to—say around 30°.

Because the sun is very distant, the flash must also be as far away as possible. You can even use a mirror to extend the effective distance if necessary. Obviously this means using a fairly powerful flashgun or else a fast film and a wide aperture, though if the subject is static and you can darken the room, you can fire the flash several times.

If the subject is small it is easier to fool the eye that the light source is infinitely far away. Distant light sources cast virtually parallel shadows. Shadows from nearby lights tend to narrow rapidly. So a nearby source is immediately obvious from the shape of the shadows—particularly with large subjects. As a rule of thumb, if the light source is further than about ten times the width of the area being photographed, the light looks reasonably natural. A light orange filter helps add to the impression especially if the 'sun' is at a low angle. Try a blue reflector in the shadows for a

hint of blue sky, but be careful not to overdo it!

Another common light source you can imitate is a table or reading light. In this case the position must be close, just as the lamp would be. You may need to place a neutral density filter over the flash head when you are using the auto function, if the flash is less than about a metre from the subject. You can use the flash direct in imitation of a naked bulb, or bounce/diffuse it to look like a shaded lamp. For this purpose a small umbrella is ideal. If you have a remote sensor the flash head can be attached to the handle of the umbrella so that it points into it, and you can position the whole thing close to your subject, right up to the edge of the picture, so that it imitates the quality of a table or standard lamp. With some white umbrellas you can either shine the flash through the fabric of the umbrella which then acts as a diffuser, or else use it to bounce the flash as a reflector. The remote sensor overcomes the problems of working out how much light is transmitted or reflected. Alternatively, you can use a flashmeter.

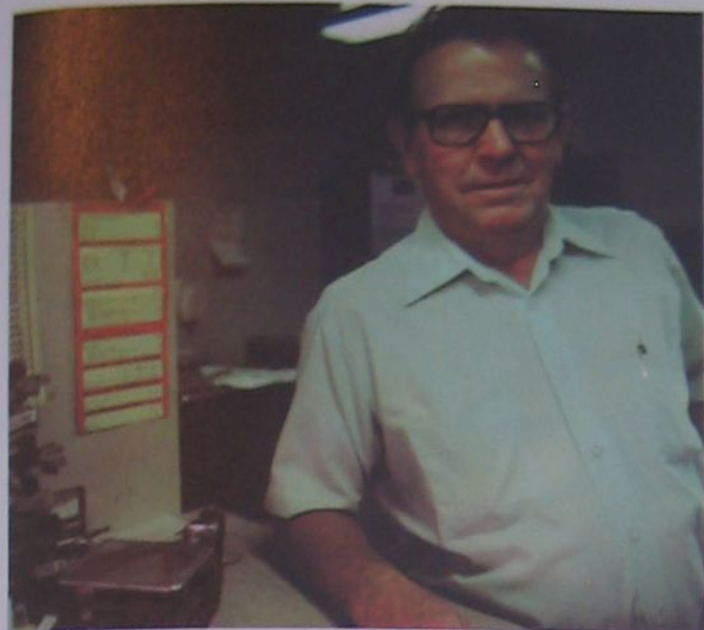
You can also bounce flash off the television screen to look like the light from a television or bounce it off a sheet of yellow paper placed low down to look like the light from a fire—the possibilities are endless.

As long as you can think of a particular light source which could be in the position you need, you just have to set the flash to that angle, distance and size of source (by bouncing or diffusing) and it will look perfectly natural.

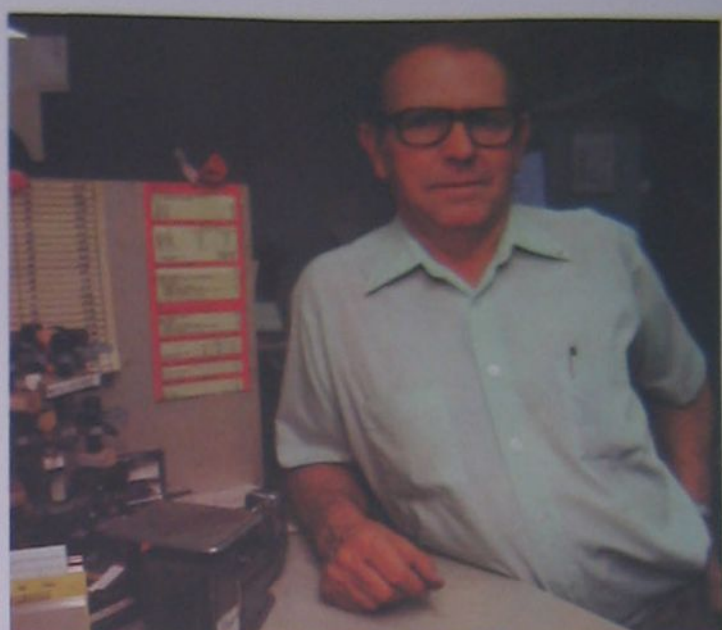
In many situations, there may not be an obvious surface for bouncing the flash from. But it is surprising how many things can be used as reflectors. Virtually any nearby surface can be used. Though strongly coloured objects may give unpleasant casts in colour shots, almost anything can be used in black and white.

Flash proportions It is very easy for the flash to dominate the picture, as can be seen from the pictures above. In the top shot most of the light is from the flash, although the daylight from the window (shown in the lower shot without flash) helps to illuminate the face and overalls. In the three shots below progressively greater amounts of flash were used, in ratios of 1:4, 1:2 and 1:1 to the available light. It can be seen how the flash has gradually become more noticeable until it finally destroys the natural quality of the light. The frontal lighting of the flash is artificial and so looks wrong when allowed to dominate





Colour change Even quite small amounts of flash can be used to clean up colour. Here a small unit was used (right) to remove the unattractive green cast caused by fluorescent lights (left) without changing the atmosphere of the light



Daylight and flash

When you wish to mix daylight with flash, perhaps to light a portrait against a window, there are different methods of doing it. To obtain a natural result, you could either bounce the flash to one side, to look like the light coming from another window, or bounce from the floor, perhaps from a white sheet if the floor is dark-toned; or from a large reflector behind the camera, to provide the large-source front lighting which might come from a white room. Since the flash is to provide the main light on the subject's face, it is easier to set this first. This is done in the normal way, setting the

camera to the same *f*/stop as the flashgun's calculator dial—unless of course, you want it a little darker or lighter than normal.

The daylight is 'controlled' by the shutter speed, and you can make it weaker or stronger just by turning the shutter speed dial. As a starting point take a reading on the general scene outside. This will probably indicate quite a fast shutter speed. If you were to shoot at this setting the light would appear to be the same inside and out and this gives a dull look to the shot.

To brighten the picture, slow down the shutter speed by one or two settings. This will not affect the flash in any way; only the daylight changes. At some point, depending on the exact configuration of the window, and your composition, you will notice that the needle indicates 'correct exposure'. At this point it might be a good idea to check that the subject's

face, not lit by the daylight, is still registering 'underexposed' on the camera's meter. Move in close and check: some light from the window is sure to reach it. As long as it is still reading 'underexposed', you can go on increasing the shutter speed for a few more stops.

There is no 'correct' setting for the shutter speed in this situation, it just depends what sort of picture you want. In any case the tolerance is enormous. A stop of two either way is not going to do much damage. You may find that the shutter speed is too short to synchronize (see page 1218) in which case you could either select a smaller aperture and work from that, or accept a brighter scene outdoors by lengthening the shutter speed. If the shutter speed is too long, either use a tripod, accept a darker outdoor exposure, or, if the flash provides for it, set a wider aperture.





World of photography

Holography

Holography has come a long way since Denis Gabor made the first blurred three-dimensional images in the late 1940s. It also promises to produce even more startling results in the future

Everyone has heard of holograms. Most people probably know that they give often, startlingly realistic three-dimensional images. But comparatively few people realize their potential or their limitations, or know that holography has everyday industrial applications in factories, as well as in nuclear reactors and in space.

Perhaps the biggest difficulty lies in understanding just what a hologram is. Imagine a photographic plate, of whatever size you please, held in front of you. In ordinary room lighting it appears a mottled grey, with fine lines and patterns across it, with no trace of an image to be seen. Dim the room lights and shine the light from a laser on to the plate. Suddenly the plate becomes a window, through which you can clearly see the subject—maybe an apple or a piece of rock. It appears to be three-dimensional behind the glass, illuminated by the unearthly laser light which is usually coloured red, green or some other pure colour. You reach behind the plate to touch the image, only to find it is not

there. You can see your hand with the holographic image superimposed on it—not projected, but with the two apparently existing in the same space.

The hologram itself can be thought of as a direct record of the light which passed through the plate at the time the hologram was made. No lens produced the image—it is a recording of the pattern of waves which passed through the emulsion. This is only made possible by using the very ordered light from a laser—ordinary light of whatever colour, is too random for the purpose.

Although they only became widely known in the 1970s, after the development of lasers, the first holograms were made in the late 1940s in England by the Hungarian-born scientist Denis Gabor. He was able to produce some rather blurred three-dimensional images using an ordinary mercury lamp, filtered to make it monochromatic, as a light source. But until the development of lasers in the 1960s there was no light source strong enough to produce good images. Once lasers became available



scientists began working to improve the quality of the emulsions for holographic plates. Today, there are permanent exhibitions of holograms in London, New York, Paris and other centres, and an increasing number of people are working to perfect their uses in science and to produce holographic works of art for display and sale in galleries like Light Fantastic in London's Covent Garden.

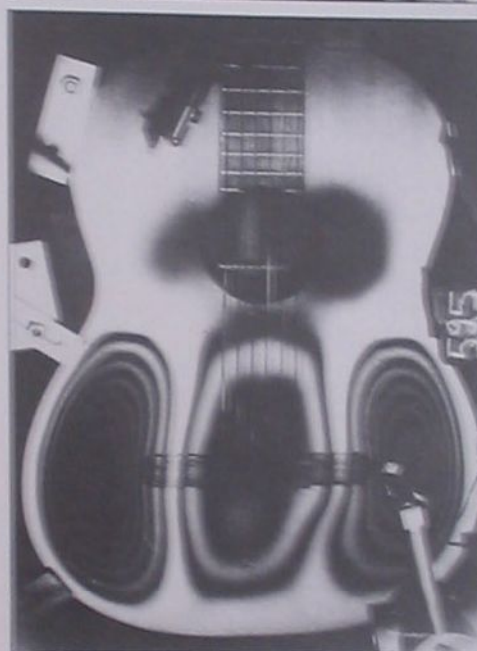
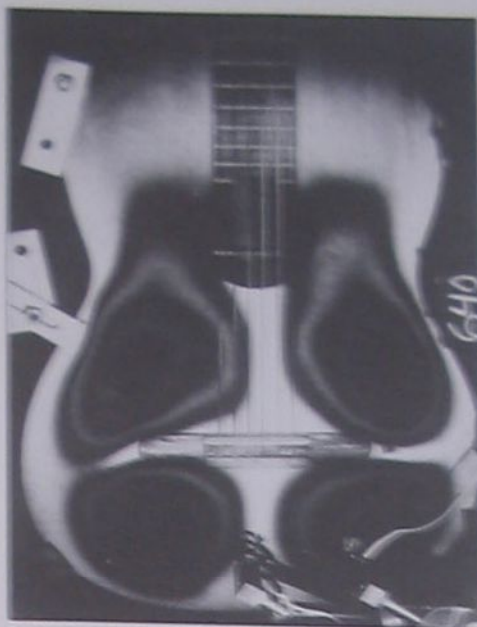
Holograms cannot normally be made of general scenes or landscapes. They are restricted to objects that can be taken into a darkened room, and which can be illuminated by a laser. A laser produces a very narrow beam of light, that spreads very little over many hundreds of metres, but larger diameter beams—typically up to 30 cm across—are often needed in practical holography. A wide beam is made by passing the narrow beam through a convex lens, called the *expansion lens*, so that the beam focuses to a point, then spreads out as a gradually widening cone.

In the simplest practical scheme for making a hologram, the plate must receive laser light reflected both from the subject and also directly from the laser. This is done in an otherwise dark room, and it is often possible to include both the object and the photographic plate in the same broad beam. The direct light from the laser is called the reference beam, and the mingling of this light with that from the subject creates an

Waves, 1979 The works of Dutch artist Rudie Berkhout explore holography's potential for using a variety of colours.

Mickey Mouse Early holograms were limited to simple figures like this. **Guitars** Holographic techniques can now be used to show the effects of sound vibrations on guitars with different internal structures.

Denis Gabor The inventor of holography portrayed next to a hologram of himself after winning the Nobel Prize



Nils Erik Molin & Karl Sletten

interference pattern (see page 2066) across the plate.

The hologram is made by exposing the photographic plate to this pattern and recording it directly. On development, the plate becomes the hologram. When the processed plate is illuminated by laser light coming from the same direction as the reference beam, the pattern on the plate breaks up the laser light by *diffraction* to form a reconstituted version of the original light from the subject, convincing enough to fool an observer that the object is still there.

The features in the pattern recorded in the hologram are several micrometres apart (one thousandth of one millimetre). Such fine detail needs a fine-grain high-resolution photographic emulsion to record it. Thus photographic plates used for holograms are capable of recording more than 2000 black and white pairs of lines across every millimetre. By comparison, a conventional 'high-resolution' film for 35 mm cameras only records about 100 line-pairs per millimetre.

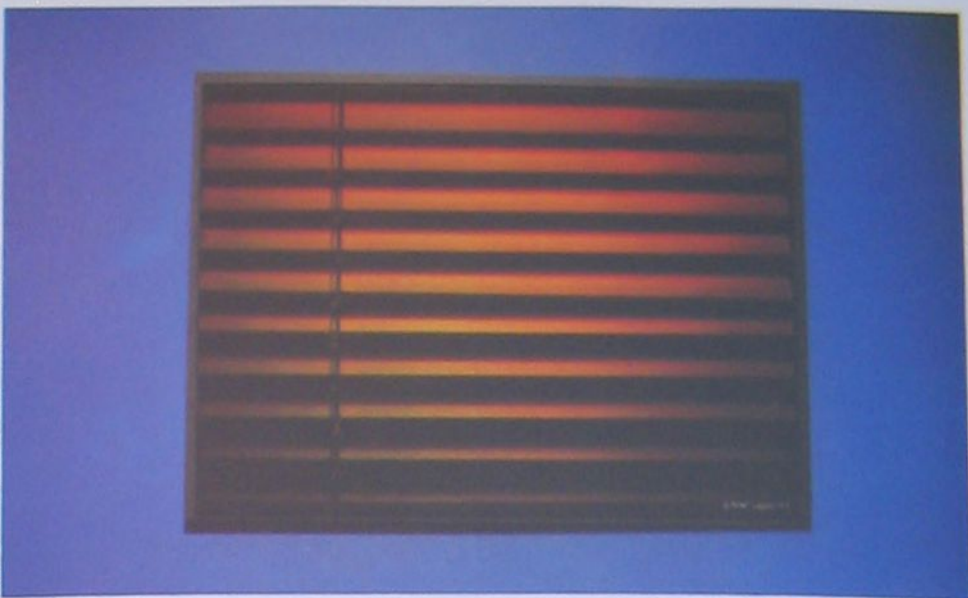
R. Rhoads/MacDonnell Douglas Corporation



Fine grain emulsions are also relatively insensitive to light—some of the emulsions used for holography have an ASA sensitivity rating less than one. So for practical holography with the common helium-neon laser, exposure times can be as long as several seconds or even minutes.

Having to use such long exposure times is a particular nuisance, because of the microscopic nature of the hologram's interference pattern. This means that the subject and all the equipment used during the recording, including the photographic plate itself, have to be completely stable. If the subject moves at all during the recording, the interference pattern will shift and will then be blurred on the emulsion. Any movement that occurs therefore makes the hologram appear dimmer.

The hologram's tolerance to movement is extremely low. Any shift in the



Michael Wenyon/Goldsmith's Holography Workshop



Linda Law/hologram: Margaret Benyon/Light Fantastic

Holograms as fine art A variety of artists now use holography as a medium to produce limited editions. They may range from the clean-cut lines of Michael Wenyon's **Venetian Blinds**, 1981 (above) to Margaret Benyon's study of form in **Rainbow, Rainbow**, 1979 (left) and the reflections of Op Art found in Linda Law's laser transmission hologram **Eve's Crystal**, 1981 (right)

contrast between red and white areas.

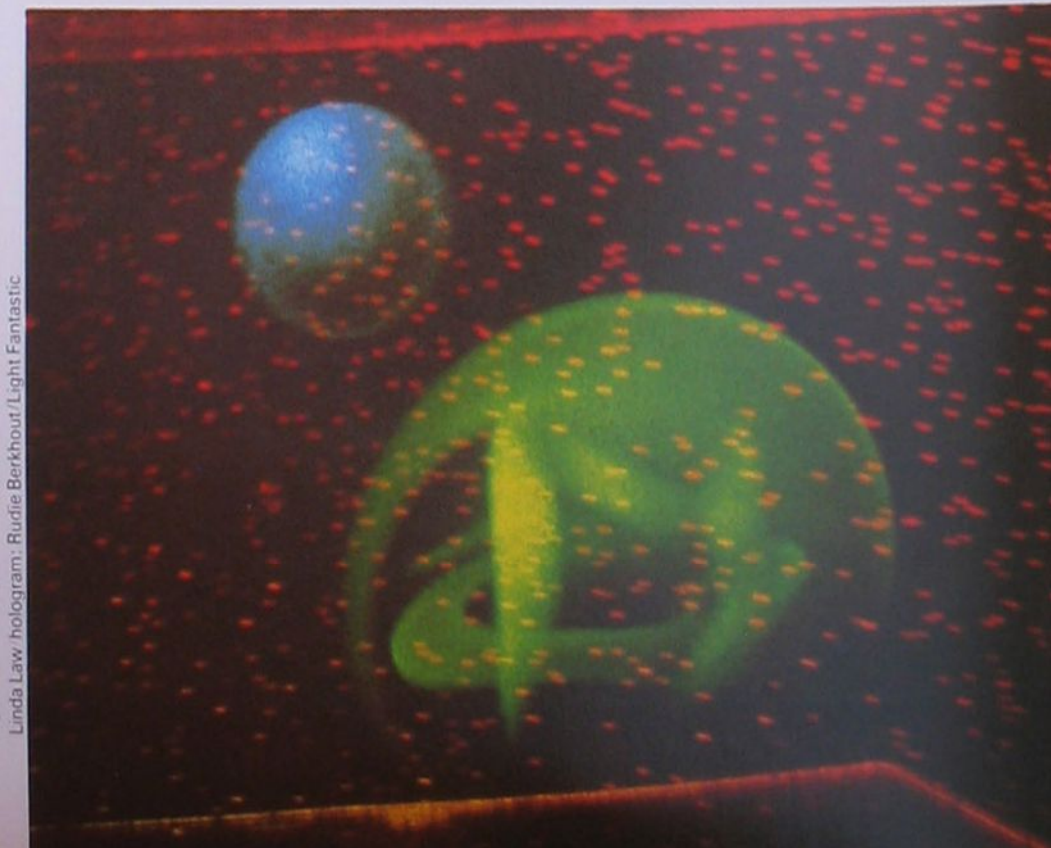
In this simple practical scheme, the subject is lit on the side facing the laser which can cast sharp, and possibly undesirable, shadows across the subject, as well as leaving almost the entire opposite side in darkness and therefore unseen in the hologram.

A partly reflecting mirror placed in the narrow beam from the laser, before it is expanded by the lens, will reflect a separate beam which can be bounced off mirrors and expanded by a separate lens

subject by more than about half a wavelength of light—about one thousandth of a millimetre—will spoil the hologram completely.

Holographers go to considerable lengths to prevent failures caused by movement. Equipment is solidly built and mounted on a heavy table isolated from floor vibrations. Often the table is a concrete slab supported on several inner tubes of car or truck tyres. It may weigh several tonnes and has a typical surface area of as much as 2 x 3 metres.

Because of the possibility of failure if the subject moves, the subject matter for holograms is often specially made. The materials should remain still during the exposure and it helps if reflective white surfaces are used, as they look brighter. Plaster of Paris meets both these needs, and is used to model many items. The 'artwork', as it is called, should be shaded in neutral tones of grey or black if necessary because the red illumination of the laser might alter the tonal rendition of the subject during recording. This may affect the degree of



Linda Law/hologram: Rudie Berkhout/Light Fantastic



to soften the shadows and provide 'fill-in' light.

If the subject has a particularly shiny surface, a ground-glass diffuser in the path of the illumination beam will spread the light more evenly. Some holographers go to considerable lengths to provide several sources of illumination for the subject, employing the approach and techniques of a lighting designer on a theatre stage set.

As human beings move by more than the allowed tolerance during an

exposure of several seconds, the helium-neon laser cannot be used for holograms of people. However, the ruby laser, based on a crystal of synthetic ruby, emits a pulse of light lasting several nanoseconds (a nanosecond is a billionth of one second). Any movement is completely frozen over such a short period. The pulse from the ruby laser is strong enough to expose the hologram but does not harm the subject.

Viewing holographic portraits is a peculiar experience. The image is

utterly lifelike and three-dimensional, but there is a certain 'death mask' quality because the subject has a fixed expression, like a waxwork.

Industrial applications

The earliest commercial application for holography, and still the one that accounts for the largest volume of sales of the special photographic plates, is a test for aircraft tyres during manufacture. A double exposure hologram is made of each tyre, with the air pressure

Future Memories, 1979 (left) A white light transmission hologram by Rudie Berkhout.

The Meeting (right) These two pictures show how Rick Silbermann's hologram of a glass has been projected on to the original glass after it was broken. When viewed from the front the glass appears to be intact, but from a different angle the hologram goes out of view completely so that only the broken glass actually shows. A similar use of holograms is to be found in industrial applications.



Linda Law: hologram, Rick Silbermann: Light Fantastic



Shop window display A series of white light transmission holograms used as part of a conventional fashion display

in the tyre changed between the separate exposures. The two images interfere with each other and a pattern of dark lines appears across the surface of the tyre, mapping out movements when the pressure is changed. Any faults in the tyre, such as a weakness in the tyre wall which might lead to a blow-out, show up as a concentration of lines in the pattern. An inspector can thus identify a faulty tyre and prevent it being released from the factory and put on an aircraft.

All the original detail of the subject is present in a hologram, more in fact than the human eye can see. Under the microscope a hologram can reveal features on the subject several thousandths of a millimetre across. Engineers operating nuclear power stations are looking into the feasibility of making holograms inside the radioactive parts of a reactor by remote control. They would then pull the hologram out and examine it under a microscope, at leisure and in safety, to look for any faults.

Crystals growing in the weightless conditions of outer space will be the subject of holograms made in an experiment planned for NASA's Space Shuttle. When the shuttle lands, scientists on Earth will be able to examine the holograms—which will be made as a series over several days—to learn how the crystal's growth was affected by zero gravity.

Although the best known holograms

are those which portray a subject, holograms do not have to do this. One of the most exciting applications for the use of holograms is to use them as lenses. This involves making a hologram that focuses light like a lens, using special optical techniques. Holographic lenses can be larger and lighter than an ordinary glass lens because the hologram is simply a flat sheet of glass. The newest generation of fighter jets are to be equipped with a visual display for the pilot using large holographic lenses.

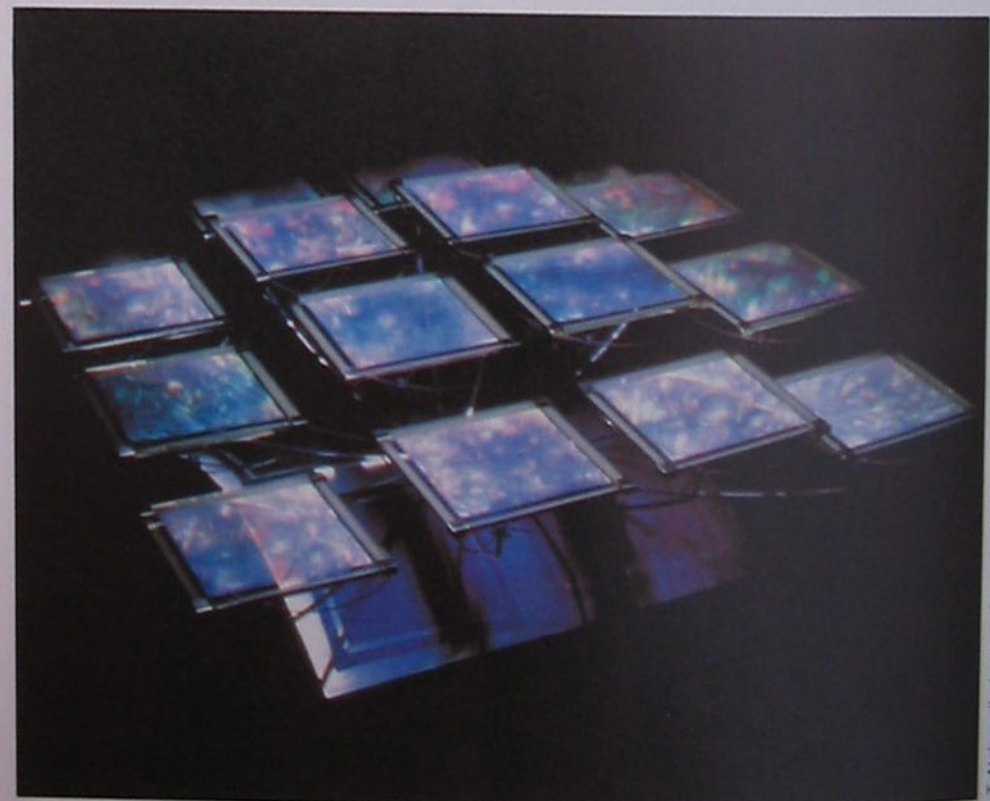
Holographic developments

Although every hologram needs a laser to make it at some stage, some types no longer need a laser for viewing. A Russian, Yuri Denisyuk, invented a hologram that is produced in an optical configuration that establishes an interference colour filter in the photographic emulsion at the same time as recording the normal hologram interference pattern. When the hologram is held in direct sunlight or in the beam from a small spotlight, only light the same colour as the original laser is reflected and the image appears in this colour. For example, if a helium-neon laser is used the image will be red.

Holograms made of other holograms are particularly interesting. When a hologram is flipped over end on end and set in the light for viewing, an inside-out version of the original subject appears to be floating the same distance in front of the hologram as the original subject was behind. The effect is quite dramatic because this image floats on the viewer's side of the sheet of glass. It is three-dimensional, and a hologram can be made of it.

When this 'transfer' hologram is viewed, the image appears either straddling the actual plane of the sheet of glass or projected in front. By turning the transfer hologram end on end the image can be turned the right way round again, and yet still be projected in front. The exact location of the image in the transfer hologram depends on its position relative to the image from the 'master' hologram when it was made.

The transfer process is a powerful creative and technical tool in pictorial holography. The special effects produced are similar to those possible when printing photographs from negatives.



Floating, 1980 A series of dichromated holograms by Setsuko Ishii, on show at the Toshiba Science Museum, Japan

Making a hologram



Reconstruction



How a hologram works The pure light of the laser reflected from the object enables the holographic plate to register an interference pattern. The image can later be reconstructed using a similar laser beam projected on to the plate.

from the same angle. Interference patterns on the emulsion layers of a holographic plate are caused by the mingling of the light from the laser and from the subject and appear similar to the patterns produced by oil on water.



introducing a game that incorporated holograms as three-dimensional scenery, against which the invaders from space will move on a conventional two-dimensional light-emitting diode display. The design is based on mass-produced embossed holograms.

Not all mass-produced holograms use the embossing process however. Hundreds of thousands of people already own holograms in the form of disc-shaped pendants depicting subjects such as the pyramid of Cheops, the crucifix, the inside of a watch and a human eye. These holograms are recorded on dichromated gelatin, a material traditionally used in making printing plates. The imaginative use of batch production techniques has made this process relatively cheap.

Images from several master holograms can be combined on a transfer hologram using multiple exposures. Some holograms made this way are visible in white light, such as the rainbow hologram invented by Stephen Benton, a research scientist at the Polaroid Corporation. It is named for its ability to produce an image which changes in colour as the viewer moves up and down.

The transfer hologram process is also useful for artists who want to run off a limited edition of fine art holograms for sale. If the hologram is a type that works in white light, it can be framed like a picture and hung on the wall. Most of the holographer's time and energy goes into making the original master hologram, possibly with an intricate subject and painstakingly complex lighting arrangements. Having produced a successful master, the artist can relax and run off copies at a later date, usually in the form of a limited edition.

Each hologram in such an edition is a hand-made item requiring several hours of work, and the process is not capable of mass production in the true sense of the word. But in the United States, holograms are now being printed on plastic film in quantities of 1000 or more. In a process similar to the production of ordinary records, the holograms are embossed by stamping plastic with a metal plate that bears the impression of the interference pattern in the hologram. The metal stamping plate is itself produced by a

special photo-etching technique which involves a transfer from an ordinary master hologram. Embossed holograms even come with a peel-off adhesive backing so that they can be stuck on any flat surface.

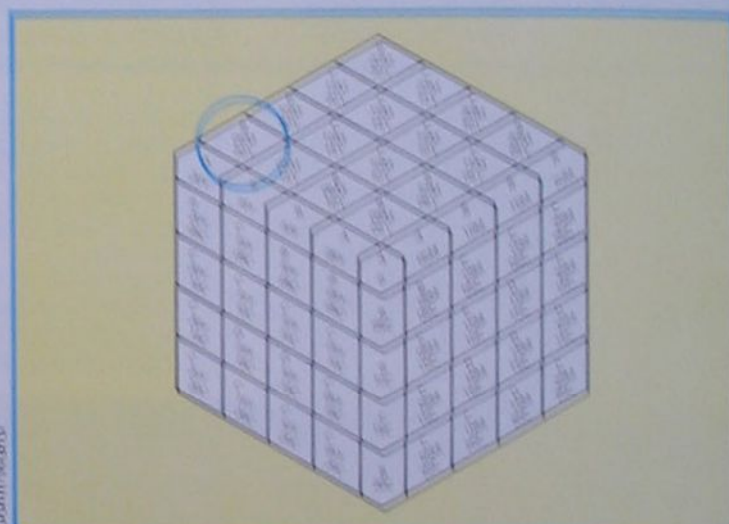
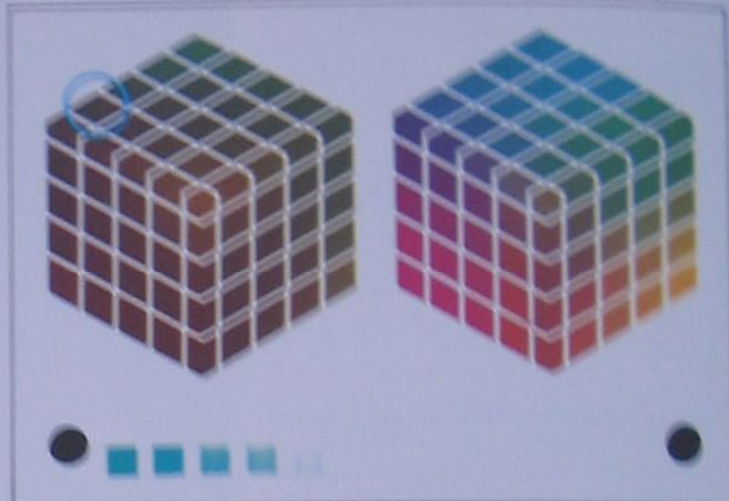
The low cost of embossed holograms has opened the door to many new commercial applications. For example, an American video game manufacturer is



A hologram of nuclear fuel elements is being projected on to this screen so that they can be checked for stress.

Colour mosaics

If you are totally perplexed by the intricacies of colour filtration, yet do not want to buy an analyzer, a simple device called a colour printing mosaic could be the answer to your problems



A filter mosaic is a low cost colour printing aid which offers a quick, simple solution to the often tricky problems of making a correctly exposed and properly balanced colour print. As it can cut down the frustration and expense—particularly with 'white light' or subtractive colour printing (see pages 590 to 593)—it is a device which may be particularly appealing to all new-comers to colour printing and anyone else reluctant to become involved with filter packs and filter settings.

A filter mosaic is especially useful for printing those 'untypical' negatives which do not respond well to the preliminary filtration which colour paper makers recommend for the 'average' negative. Kodak, for example, suggest making a first test with a filter pack of 20Y + 50M when printing Type 2 colour negatives on Ektachrome 78 paper. But only rarely will this filtration be exactly right for your particular negative—and

you have to go on and try to determine the strength and nature of the cast before a corrected print can be made. Although a cast identification table can help you on your way (see pages 1844 to 1847), several more prints need to be made.

A mosaic, on the other hand, may require just a single, small-sized test print to provide the necessary exposure and filtration information, which accounts for the appeal of such a device.

A mosaic consists of small areas of yellow, magenta and cyan colour printing filters arranged in order within a fairly small plastic frame. The filters are arranged in their various densities and in various combinations to correspond with a variety of different filtrations.

Ideally, the colour printing filters you use should be the same as the filters in your mosaic. If they are not the same there may be errors, particularly when strong filtration is involved. In many cases, the makers of a mosaic will also

First print Estimating that filtration would be about 38Y 50M, a mosaic test was made using the Mitchell Unicube. This indicated 20Y 03M additional filtration (the value is shown ringed) for an integrated grey to give the result shown

supply colour printing filters to match.

If you use a colour mixing head, these errors have to be established by trial and error and noted for future work.

Using a mosaic

The filter mosaic is simply laid on a small piece of colour paper and exposed to the deliberately scattered image of the negative you wish to print.

Set up your enlarger in the normal way, remembering to include a Wratten 2B (or similar UV filter) and focus a colour negative to the required size, before stepping down to the aperture you intend using. A diffuser of colourless, translucent, opalised plastic is

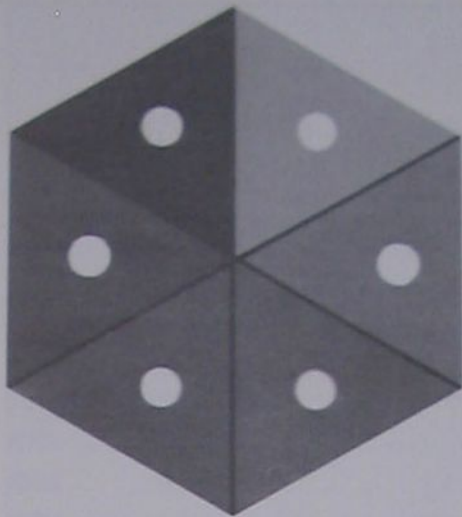
usually provided with the mosaic. Hold this beneath the lens to diffuse the projected image when you make the test exposure. Some types of diffuser can be fitted to the red swing filter stalk beneath the enlarger lens carrier panel, and can be swung in and out of the light path.

In darkness, cut a sheet of colour printing paper to match the size of the mosaic you are using, and place this piece—with the mosaic laid on top—directly beneath the lens so it lies centrally on the baseboard. Give the test exposure time recommended by the makers of your particular mosaic. Make sure the 'frame' of the projected beam is central or the diffuser frame shadow may clip the edge of the test print and cause unreliable readings.

Process the test print and, after drying, inspect it in good strong light. It should show patches of slightly different colours corresponding to the various filter combinations.

In principle, all you have to do is to locate the patch that is closest to untinted grey and use the filter values which correspond with this for making up (or adjusting) filtration for a full sized print. These filter values may be engraved on the mosaic or—more likely—provided in the form of a table whose shape resembles the pattern of colour patches on your test print.

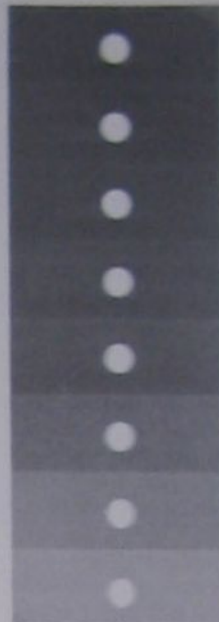
If you are starting from scratch with no filters in the enlarger, it is likely that no area on this first print will be even close to grey. The predominant cast—likely to be orange—has to be removed. Make a second test print, this time with some filtration—say 60Y + 40M to remove the orange cast. Better still, use the basic filtration recommended for your negative type by the maker of the paper you are using. As a short cut, this could be used right from the outset on the first test print. One of these should give a test print which contains a perfect grey.



Filtering to neutral

To make it easier to find the most perfect neutral area from among many that are close to neutral, you can use a comparator consisting of a grey wedge printed on black and white paper. These are sometimes supplied with the mosaic. Each step of the comparator has a circular hole within it so that any patch in the test print can be isolated and compared directly with a true grey of a silver deposit. Choose a step on the wedge that has roughly the same visual density as the grey you are assessing and place the comparator over the print to check.

If you now add the filter values given for your chosen patch on the mosaic—say 15Y + 5M—to the filter pack already in the enlarger, you should now have the correct filtration. In addition, your filter mosaic may have a row of coloured patches of varying density. By choosing the faintest patch visible you can estimate the correct exposure for the final print with the help of a table supplied with the mosaic. But this method is not very accurate and can only



Grey comparators
These are used to assess which of the segments of a mosaic test print most closely approaches a neutral grey, of whatever density. The one far left is provided with the Mitchell Unicube, the nearer one with the Simmadot set. If you make your own printing mosaic, it would be easy enough to provide a scale of greys such as this on ordinary black and white print paper—just expose a test strip to white light

be used for a final test print.

In the test shown here, the row of cyan squares also shows whether or not the exposure requires altering for the final print. The faintest discernible square, which is encircled, is used.

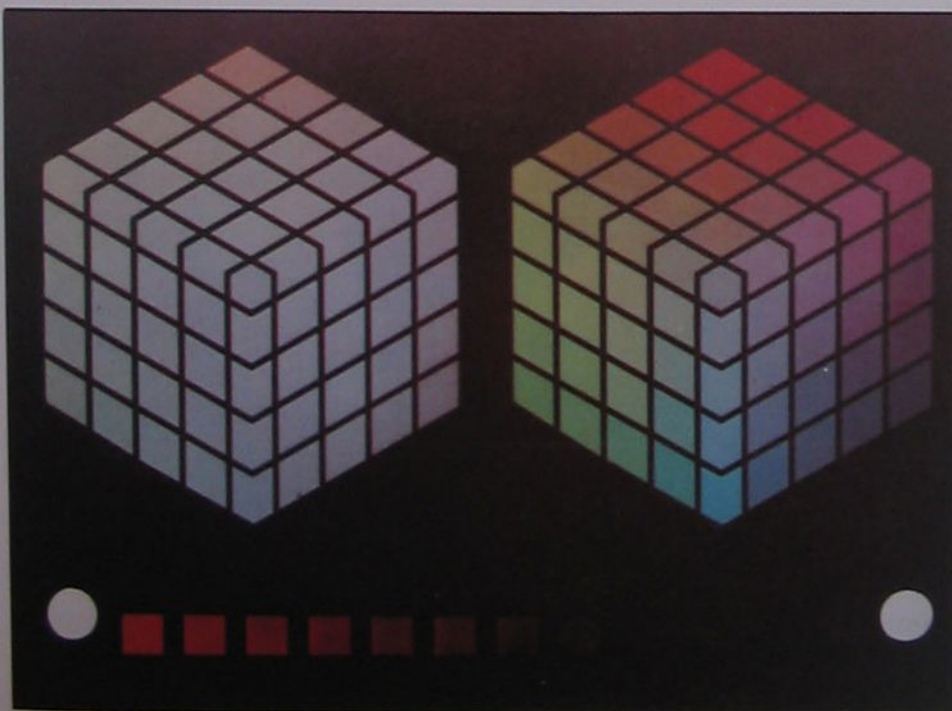
Subject failure

Filter mosaics work on the principle of integration to grey. If all the colours of a multicoloured subject could be scrambled or thoroughly mixed together, the result would generally be a neutral grey. Hence the exposure you give through a filter mosaic by the scrambled light from the diffuser over the enlarger lens should produce a neutral grey and has to be filtered for you to achieve this result.

The principle of integration to grey can break down with a scene containing a large area of a single brilliant hue, to cause what is known as *subject failure* (see page 1554).

Any system based on integrating all the colours on the negative, whether you use a filter mosaic or a colour analyzer, will produce a print with a colour cast complementary in hue to that of the predominant colour in the scene. For example, in a shot of someone standing in a pool of turquoise coloured water, the unwanted cast on the subject is likely to be reddish—red being complementary to the turquoise of the pool tiles.

Even though you may hear a great deal about subject failure in colour printing, it is encountered much less often than you might suppose. The automated colour printers used by commercial photo-finishers make use of integrated negative evaluation systems which produce a very high percentage of good prints. For example, if you take a picture



Mosaic for slide printing This is the result you get when using a mosaic for reversal printing. The right hand mosaic has bigger filter steps, more often used in reversal printing. The left hand one is used for negative printing and for fine tuning in reversal printing

of a landscape which includes a large area of blue sky it is quite likely that integrated evaluation by a filter mosaic will give an acceptable result, since other colours in the shot are likely to counteract the blueness.

Filtration chances

Any changes in the filter pack or filter settings of a colour head involve changes also in the exposure time you will have to give to a print. You can refer to a table of filter factors to work out the new exposure having changed a filter pack.

In taking filters out of a pack and putting others in, the existing exposure has to be divided by the factors of the filters inserted. If several filters are removed or inserted their factors have to be multiplied together and then divided into the exposure or applied as a multiplier.

For example, if you remove a 10Y filter with a factor of 1.1 and a 50M filter with a factor of 2.1 the factor to be divided into the exposure is 1.1 multiplied by 2.1 which equals 2.3. If you then put in a 40Y with a factor of 1.1 and a 30M with a factor of 1.7 the factor to be used as a multiplier of the altered exposure is 1.1 multiplied by 1.7, which equals 1.87.

Tricolour exposing

An alternative method of exposing colour paper is to give three separate exposures through blue, green and red filters—additive or tricolour printing (see pages 810 to 812). Although this system is more economical as regards outlay on filters it can prove deceptively simple and some people have great difficulty in getting the balance right by adjusting the times of the three exposures.

Special filter devices are designed to help determine the three relative exposures with a single test exposure on a small sheet of paper. These aids take



Additive wedge This wedge is used like a mosaic—the faintest discernible step in each colour indicates the exposure time through each filter

steps in yellow, magenta and cyan. A scale of exposure times in seconds along the wedge enables the blue, green and red filter exposures to be read off at the point coinciding with the faintest discernible step in each of the three colours. Subject failure can occur in additive printing for the same reasons as with filter mosaics used in subtractive printing.

An additive device of this sort can be used for subtractive printing. Choose a filter pack that will produce colour wedges of the same length, with the faintest discernible density in each colour.

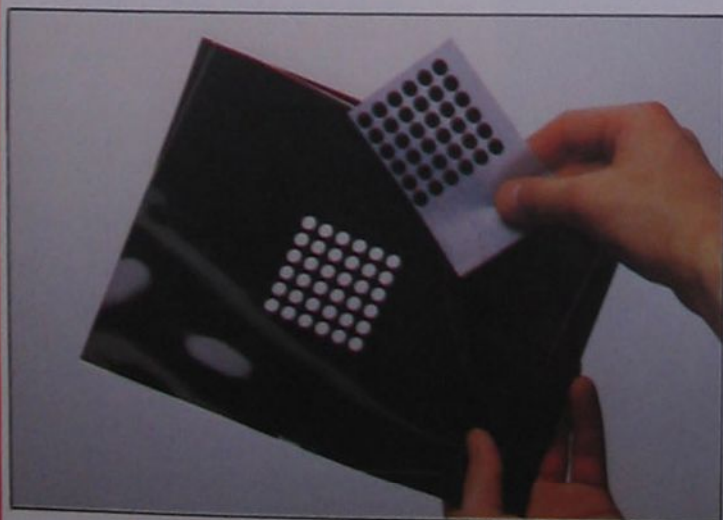
Printing from slides

A filter mosaic can be applied both to printing from colour negatives and to printing from slides on reversal material. Because paper for printing negatives has higher contrast than the reversal paper used for slides, a mosaic for negatives should have smaller filter steps than one for reversal paper. Typical filter steps for negative-positive printing are 0.5, 1.0, 1.5, 2.0 and so on. For printing from slides, filter steps of 20, 40, 60 and so on are more appropriate.

Removing unwanted casts

To apply filter mosaics and filter wedges correctly you must remember the simple rules covering the elimination of unwanted casts. To recap, if you are printing from negatives by the subtractive method, you can remove a cast by adding filtration the same colour as the cast or by removing filters of a colour complementary to the cast. Using the additive exposing method, you must decrease the exposure through the filter

Making your own colour printing mosaics



1. To make your own mosaic, use a sheet of adhesive dots for a 'negative' and contact print this on to a sheet of lith film to make the mask and apertures you need for the matrix



2. Cut 1 cm strips from yellow and magenta CP filters and tape these in sequence along the apertures, one colour at right angles to the other (see text)

Roger Payling

complementary to the cast. A yellow cast, for example, means that you reduce the exposure through the blue filter. Blue is complementary in hue to yellow.

When you are printing from slides on to reversal paper using the subtractive method a colour cast is removed by removing filters from the pack the same colour as the cast, or, alternatively, you can add filters complementary in hue to the cast. It is not usual to use the tricolour method with reversal printing but if you do, remove a cast by increasing the exposure through the filter complementary to the cast. Thus you remove a magenta cast by increasing the exposure through the green filter.

Making your own filter mosaic

You can make a filter mosaic to suit your own needs quite easily. Ektacolor paper normally calls for a combination of yellow and magenta filters and hence a simple mosaic of these two colours may be all you require. Some sheets of high contrast lith film large enough to be printed with a pattern of clear circles arranged in a 60 mm square are the first requirement.

The pattern of circles can be contact printed using a 'negative' conveniently available from most stationers in the form of adhesive spot labels. These are supplied ready attached to translucent paper arranged very conveniently in rows with their centres one centimetre apart—those dark coloured spots with a diameter of about 8 mm. The spots can be made completely opaque using a black spirit marker or Indian ink. Leave a group in a square measuring six spots in each direction, and contact print this, as a negative, with your film.

Process the film as normal. However, the contrast of such a negative is so high that it is not really necessary to use a lith developer. It may be more convenient to use printing paper developer at twice

Filter factors for Kodak CC and CP filters

filter factor	filter factor	filter factor	filter factor	filter factor	filter factor
05Y 1.1	05B 1.1	05M 1.2	05G 1.1	05C-2 1.1	05R 1.2
10Y 1.1	10B 1.3	10M 1.3	10G 1.2	10C-2 1.2	10R 1.3
20Y 1.1	20B 1.6	20M 1.5	20G 1.3	20C-2 1.3	20R 1.5
30Y 1.1	30B 2.0	30M 1.7	30G 1.4	30C-2 1.4	30R 1.7
40Y 1.1	40B 2.4	40M 1.9	40G 1.5	40C-2 1.5	40R 1.9
50Y 1.1	50B 2.9	50M 2.1	50G 1.7	50C-2 1.6	50R 2.2

Note: the cyan filters with the suffix '2' are for use with Ektacolor papers for printing from colour negatives. Cyan filters without this suffix are recommended for Ektachrome 14RC papers

normal working strength—the resulting film positive will show clear circles and an opaque background.

Next, arrange strips of 05, 10, 20, 30, 40 and 50 yellow colour printing filters in sequence along one axis, so that each strip covers the distance of six clear circles. Allow enough overspill to enable you to tape each strip in position. Double-sided adhesive tape is particularly useful for this. Then fix strips of 05, 10, 20, 30, 40 and 50 magenta in sequence and at right angles to the yellow strips. This gives a mosaic where the value of each circle ranges from 05Y + 05M in 36 permutations to 50Y + 50M. You may find it useful to draw up a small table or overlay showing these values so a particular value is identifiable.

For maximum flexibility to cover all makes and types of colour printing papers, you can make three such mosaics—yellow-magenta, magenta-cyan and yellow-cyan. If you are using the yellow-magenta mosaic with Ektacolor 78 paper for which Kodak suggest a starting pack of 90Y + 50M, you can put

in starting filtration of 70M + 30M. This, in effect, 'boosts' the mosaic's range of filtrations from 75Y + 35M to 120Y + 80M, from which a filter combination giving neutral balance can be found.

You can make your own filter mosaic from filters the same as those you use on the enlarger and this solves the problems of filter wastage and of matching your mosaic filters to those used in printing. The smallest colour printing filters normally available are 7 cm square and these are more than big enough for the small filter drawers used in a 35 mm enlarger. A strip one centimetre wide can be cut from each for making a mosaic without it rendering the filters useless.

Different types and makes of colour papers require different basic filter packs under the same enlarging conditions and you should consult the makers' instructions with regard to a basic filtration. If there is no such recommendation you should make a mosaic test with no filter other than an ultraviolet absorber.



3. This shows what a mosaic produced in this way looks like. Yellow and magenta filters in strengths 05, 10, 20 and 40 were used singly and in combination

05Y 05M	05Y 10M	05Y 20M	05Y 30M	05Y 40M	05Y 50M
10Y 05M	10Y 10M	10Y 20M	10Y 30M	10Y 40M	10Y 50M
20Y 05M	20Y 10M	20Y 20M	20Y 30M	20Y 40M	20Y 50M
30Y 05M	30Y 10M	30Y 20M	30Y 30M	30Y 40M	30Y 50M
40Y 05M	40Y 10M	40Y 20M	40Y 30M	40Y 40M	40Y 50M
50Y 05M	50Y 10M	50Y 20M	50Y 30M	50Y 40M	50Y 50M

4. It is helpful to draw up a table so that any value can be located quickly. This mosaic has yellow and magenta values of 05, 10, 20, 30, 40 and 50

Equipment care

Photographic equipment requires regular care and attention if it is to function reliably. And though some maintenance jobs must be left to experts, there is much you can do yourself with proprietary aids



Dusting and cleaning aids are available separately or in kits, and range from lint-free cloths and lens tissues to puffer brushes and aerosol blowers

for example, is not considered fair wear and tear by its makers. Any action that results in a camera, lens or meter being shocked should, therefore, be avoided.

It is also important to operate the equipment within its limits. For example, do not continue to apply a turning force to a lens after it has stopped at either the closest or the farthest focusing distance. And when you change a lens, you should align it as indicated in the instruction manual, and turn it only within the limits advised.

Avoid touching the optical surfaces with your fingers or with any other object, because their performance will be impaired by smudges or scratches. And do not place the equipment where it is likely to be scratched or soiled. Usually, equipment is supplied in some kind of protective case. Used wisely, these should be invaluable aids.

An ever ready case gives good protection against shock, scratches and moisture and enables the camera to be brought into use rapidly. This type of case is useful if your camera has a fixed lens or if you are content to use an SLR with only a standard lens. Cases with a detachable flap are preferable, because once the flap is removed there is no danger of it obscuring the view of the lens. Soft, padded material is preferable to hard, stiff hide which can rub against the camera or lens and cause wear.

Ever ready cases spoil the feel of the camera and make it more difficult to hold, so if you are going to film extensively you should remove the case and make use of the carrying strap. For this reason, it is important that the carrying strap should be attached firmly to the camera lugs rather than the case.

It is not uncommon to see expensive cameras being carried on cheap, shoddy straps with soft metal catches and weak attaching rings. Even a mild tug on the camera could send it crashing to the ground. Repairs cost much more than a strong, well-designed strap, so the purchase of one will be money well spent.

A narrow strap is uncomfortable round your neck unless it is fitted with a rubber pad. Many photographers favour a wide webbing strap, which is strong and comfortable and can be removed quickly when the camera is being used on a

A photographer's most valued possessions are the items that make up the outfit. The work produced is affected by their condition and performance, and if they do not serve reliably, then photographs will be inferior due to working with poor quality tools. In the first instance, the service you obtain from your equipment depends on how well it is made but, ultimately, it is how well you care for it that matters most.

Naturally, when you buy equipment you are conscientious about value for money, reliability, specification and performance—that is why reputable brands are more popular than often less expensive ones. Your attitude should not change once you have brought the equipment home. Instead, you should endeavour to keep it serviceable so that it does not malfunction when you need it.

Whether you use your equipment frequently, occasionally or not at all, you will need to give some thought to care and maintenance. Placed in a glass case, a new camera might be expected

to remain in mint condition, but do not be surprised if it does not work after many years of storage. Lubricants can evaporate, deteriorate or even harden, resulting in malfunction of crucial mechanisms. Most amateurs, however, will not have such an experience because their photographic equipment is more likely to be used extensively. And besides considerations such as reliability and a sense of pride in maintaining your equipment in good condition, the resale value when you wish to update is an important factor. This does not mean that you should restrict your use of the equipment, rather that you should not abuse it.

Precautions and accessories

There are several accessories that will help to protect your equipment, but their use must be combined with careful handling. Remember that optical goods are precision instruments with delicate mechanisms that must remain aligned accurately. The occasional bump against a lamppost or soaking in a pool of wine,

Simon de Courcy Wheeler

Routine cleaning



Brushes are an important part of any camera cleaning kit. Use them regularly to prevent grit particles entering the camera's mechanisms



Blowers A pointed puffer is ideal for blowing dust from awkward recesses. Blow gently to avoid spreading the dust to inaccessible areas



Lenses Front and rear elements can be kept dust free if you attach a UV filter for protection and replace the lens caps when the lens is not in use



Lens fluid can be used to remove finger marks and water marks from lenses, but remove dust and grit first by brushing and puffing gently



Lens tissues are free of lint and coarse particles, both of which occur in ordinary tissues and cloths. Use several lens tissues in turn to avoid scratching



Body exterior of cameras and lenses should be brushed, blown and then wiped with a lint-free cloth. Do not use oil or polish of any kind on your equipment

tripod. Heavy, ornate hide straps are visually appealing to some people but they are less practical. It is wise to keep the carrying strap as short as possible, so the camera will not swing and strike an object when you turn quickly.

Invariably, lenses are supplied in imitation leather cases, often well made and usually fitted with a carrying strap. If you like to use your camera with just one extra lens, it might seem a good idea to carry the camera in an ever ready case slung over your shoulder, but this arrangement has practical drawbacks. To begin with, you need to remove the lens from the camera, then remove the spare lens from its case and attach it. To do these operations, you must either place one of the lenses on the ground (a totally unwise procedure) or in your pocket where it is likely to gather dust or be scratched. One solution is to carry a spare lens case fitted to one of the two straps, or else to a third strap—though

this can prove cumbersome.

Cases provide good protection against dust and accidental knocks, and are ideal for storing equipment but they are not suitable as packaging. Placed in a suitcase or ordinary shoulder bag, photographic equipment is susceptible to accidental damage, particularly if you go by public transport. Often, baggage is dropped and thrown about carelessly. And in the unpressurized hold of an aircraft, lubricants can evaporate in flight and be redeposited afterwards on crucial components. If you need to travel extensively with your equipment, a gadget bag might be a wise purchase.

The range of gadget bags on the market is probably wider than the range of cameras. Do not buy a bag merely on its visual appeal. A smart, impressive one can be more of a hindrance than a help. There are two main types: soft and hard. Soft cases are usually easy to carry, because they mould themselves to your

side and are light. Hard cases provide better protection but can be uncomfortable to carry.

Whatever case you buy, it should be sufficiently large to provide at least one empty compartment, which can be used to hold the lens you remove from the camera in safety. Most importantly, however, the case should give adequate protection to the equipment and be easily accessible. Photographers who travel long distances will value lightness and comfort above extreme rigidity and proof against vibration.

Even if you use a gadget bag and case, you should also attach the protective plastic caps supplied with camera bodies and lenses. These are invaluable to prevent dust accumulating on the optical components. On SLR lenses, back caps are more important than front ones. You can remove dust easily from the front surfaces, but if the operating mechanism at the back becomes jam-



Uncovered Do not leave the motor drive plug off or dirt may enter and ruin these delicate parts

Corrosion The result of not thoroughly cleaning equipment that has been used in salty atmospheres

hazardous conditions will need more frequent cleaning.

Routine care

Cameras and lenses should be inspected for internal and external damage. Most accidental knocks are noticed only when a lens does not stop down, or when the image appears to fall off to one side. On the exterior, look for dents, scratches on optical surfaces and loose or missing screws. Shake the equipment and listen for rattles; operate it and try to detect stiffness, looseness or erratic action. If you find any of these symptoms, you should seek the advice of a repair specialist.

Remove the lens and open the back of the camera. Look for fragments of film, hairs or insects that might jam the mechanism. Inspect the mirror but do not touch any moving parts. You should try to spot signs of corrosion or obvious signs of wear, as well as foreign objects. Insects or small specks of dust or paint lodged between optical elements are a nuisance more for the anxiety they cause than for the extent to which they impair performance. In fact, such objects need to be considerably larger than about a millimetre in diameter to justify the expense of dismantling a lens to have them removed.

Unless you have abused your equipment, the chances are that you will detect only a small amount of dust on the inside of a typically used camera. Any cleaning should be carried out with the utmost care, bearing in mind that on no account should you touch the mirror, shutter and moving parts. Using a soft, pencil-sized brush, remove as much dust

as possible from the inside of the camera, without touching the mirror. The mirror is made of aluminium, which marks easily and can be cleaned properly only by an expert.

If a film fragment sticks in position, it can be loosened with a tuft of synthetic cotton on a tooth pick. On no account should you try to loosen fragments by oiling. A common cause of malfunction is oil applied by well-intentioned users. Your camera operates dry, except for a few key points, which are accessible only after extensive disassembly, so do not include an oil can in your maintenance kit. If the mechanism is stiff, then consult a specialist.

To aid dust removal, you can buy 'puffer brushes', which blow as well as brush. These can do more harm than good, unless they are used wisely. In any event, the cheaper ones deposit loose hairs inside the camera, and should not be used. Equally dangerous, the blowing action might lodge fragments of film or grit into crucial mechanisms, causing malfunction. It is far better to brush only first so that larger particles are not carried farther into inaccessible areas.

After brushing, blowing is a good second stage, but this also requires caution. Vigorous blowing merely compacts dust (especially if you moisten it by using a 'Dust-off' inverted) where you cannot reach it. A fine nozzle attached to a typical compressed gas container is suitable, because it can be directed into small corners and curved easily, but a gentle blowing action is most important. Remove the focusing screen and blow, but do not touch its surface. This is all the cleaning that the interior of the camera will need.

The procedure for cleaning a lens is similar. Firstly, brush the body of the lens but not the optical surfaces. Follow this by gentle blowing. If you accidentally make a fingerprint on the glass, it should be cleaned as soon as possible. If left uncleaned, the grease can damage the coating and even the glass itself. Never try to polish the glass with a cloth or handkerchief. However clean these appear, they might still contain grit or abrasive tissue which can damage the lens coating. Equally likely, a small particle of grit might lodge invisibly on the coating, and be ground into it.

To clean the glass, blow it gently and then wipe it gently with a lens tissue moistened with a drop of lens cleaning fluid. More than a drop of fluid is excessive, and will only compact dust in some areas. It is a good idea to use more than one tissue. Use the first one very lightly, in case there is grit on the lens, then polish wipe with the second.

The camera can now be reassembled, with dust caps fitted where necessary, and the body exterior cleaned. All that is needed is gentle wiping with a soft, fluff-free cloth. Do not polish or wet the body, nor use chemicals or detergents on it, because these could seep inside and cause damage to the many delicate internal mechanisms and circuits.



med you will need the services of a mechanic. Nevertheless, equipment care is a compromise between protection and accessibility, so protection should not be taken to extremes. A lens with front and rear caps placed in a plastic bag inside a lens case, which is in turn in a gadget bag, takes a long time to bring into action. The protection measures you take, therefore, will depend on the conditions under which you operate the equipment.

Meters also should be protected from shock. The moving needle type is more prone to damage, so the neck cord usually supplied with the instrument should be used during measurements. Shock is not a problem with solid state meters, because they have no moving parts. The major source of trouble comes from old, leaky batteries.

All batteries used to power photographic equipment should be replaced regularly—preferably at least once a year and should be removed when the equipment is not being used for an extended period. This might also be the time when you clean and maintain your camera routinely, but extensively used equipment or that used in



Strap hanging If your camera has a long carrying strap, do not allow it to swing about. This can cause all kinds of severe damage from knocks and bumps



A metallic lens hood can be an effective shock absorber, and may protect the lens mechanisms from damage should the camera be knocked—if you swing around and hit something

Hazardous conditions

Extremes of cold can impair the performance of your equipment but a sudden change of temperature is more cause for concern. Under normal conditions you are unlikely to encounter temperatures that are sufficiently low to cause malfunction. By merely going from outdoors on a cold wintry day into a warm room, however, the cold surfaces of the equipment will condense water vapour in the warm air, causing droplets.

The droplets can impair performance of optical surfaces and lead to corrosion of metal parts. These risks can be avoided if you air the equipment thoroughly, rather than storing it away immediately in cases. Even better, you could play a hair dryer over it from a distance of about 0.5 m, but ensure it never becomes heated much above room temperature.

Water is another common hazard, but the odd shower of rain is not likely to cause any damage. If you need to use the equipment in the rain for extended periods, then cover as much as possible with polythene bags, and dry it carefully after use. If, however, you immerse your camera or lens in water or any other liquid, you should take it at once to be rectified, but bear in mind that some lenses are expensive to dismantle.

One liquid that you should never allow to come into contact with your equipment is salt water. This is so hazardous that you should consider taking your camera to the seaside only if you must. Remarkably, you do not need to wet the equipment or even get a fine spray on it, just being in the atmosphere is sufficient to cause extensive damage.

The salty air enters the mechanism and causes extensive corrosion, which might take some time to discover and is

very expensive to rectify. And if you have the misfortune to drop your camera or lens into the sea, you can virtually write it off. Some repairers will not work on equipment once you mention the possibility that it might have been contaminated by salt. Some people advise immediate immersion in fresh water, but this is unlikely to wash away all the salt, and might also do damage itself.

Wind-blown dust is not corrosive, but it can cause immense damage. Usually, only the finer particles are blown, and they are just the ones to become lodged in between moving components, so you

should avoid these conditions. If you encounter them, then clean the equipment immediately after. Use a soft brush thoroughly, then a blowing device. But remember to use only gentle blowing.

The same procedure should be used to remove sand. If you drop a lens into sand, you should not operate it until after brushing thoroughly, otherwise particles might become lodged between the moving components. Such disasters may happen accidentally, but your best course is to take precaution to ensure they are avoided in the first place; the remedy can be expensive.



Scrambled You cannot strip a modern SLR without professional skill and equipment. If you do you will probably ruin it and a repair will prove costly

all photographs by Simon de Courcy Wheeler

Assignment

River ramble



Robin Scagell



Walking through the countryside is a very popular pastime. Every weekend, people set off for country rambles armed with their cameras—and quite often they return home having taken no pictures at all. Some stretches of countryside may well appear to be quite featureless to the casual walker. But to the experienced wildlife photographer, there is something every few steps that is worthy of a

few frames of film.

To prove the point, we asked Heather Angel to spend a day along a stretch of a small river. Heather is a leading wildlife photographer, with many books to her credit, and sure enough she found plenty of pictures within a very short stretch of the river Itchen in Hampshire—a chalk country stream famous for its fishing.

The English spring was under way, but

there were no masses of wild flowers or flocks of waterbirds to be seen—just a few dandelions, coltsfoots and marsh marigolds, with swans, ducks and coots scuttling about building nests or raising chicks. Few of the trees were in leaf, though many were in bud.

Heather carries a wide range of lenses for her Nikon F3: on this occasion she had 20, 35, 200 and 400 mm lenses, as well as



Heather Angel



The river This chalk stream is clear and unpolluted—35 mm shot using a polarizing filter. **Liverwort** This was growing on a shady wall which formed the river bank, so Heather used a folding foil reflector to gain more light. She took the picture standing in the river, holding the foil with one hand, with the camera on the Benbo tripod. The use of flash would have spoiled the natural appearance of the shot.



Heather Angel



Heather Angel

Versatile tripod Heather always uses this heavy duty Benbo tripod, which allows her to move in very close to her subjects. Notice the green tape she puts on the cable release to make it easier to find when dropped. Here she uses the 55 mm Micro-Nikkor to photograph a nettle. **Mute swan** Even the simple activity of the swan drinking lends interest to the shot. **Ash flowers** These tree flowers open before the leaves. 105 mm macro lens. **Willow bark** The lichens on the bark make an attractive picture, yet they could easily be overlooked by a casual stroller. The macro lens enabled her to reveal tiny details of the lichen.



Heather Angel



Heather Angel



55 and 105 mm macro lenses for close-up work and a 35-70 mm zoom. For almost all her pictures she used a Benbo tripod—a unique design which allows her to support the camera very close to the ground without the need to reverse the head, as most others do.

Other essential aids to photography for Heather are a pair of waders—she quite happily takes her shots from in the river looking out—and a 'Bulldog' photographer's jacket, like the tripod British made, with ample and numerous pockets for lens caps, films and so on. But she disdains all of the current range of camera bags and holdalls, preferring instead to use an ordinary rucksack. She can sling this on her back and clamber over rough ground without needing to use her hands to carry the gear.

The day was bright, with little wind,

which pleased Heather. 'Windy weather worries me much more than lack of sun,' she said. Even on a bright day, wind means that fast shutter speeds are needed to prevent stems and branches from blurring. Heather has now moved away from the use of flash to provide light on a dull day. 'I don't use flash very much except when I'm going to work in a cave. I would much rather use a long exposure with a tripod.' She uses Kodachrome film whenever possible, particularly Kodachrome 25. To counter this film's lack of sensitivity, Heather uses portable reflectors, which she holds in place with one hand while operating the cable release.

One feature of Heather's wildlife photography which makes her pictures stand out is her attention to the backgrounds and foregrounds. 'I do a lot of shots with the emphasis on the fore-

Coltsfoot seed head Heather used a 55 mm Micro-Nikkor lens (macro) for this shot, which is half scale on the Kodachrome transparency and is shown here twice life size. The shadow behind was deliberate, to make the fronds stand out better from the background. **Dandelion** Even abundant weeds can make attractive studies. 55 mm macro. **Coot** Heather used a 400 mm lens and Ektachrome 200 film for this picture of the waterbird carrying nest material

ground so as to crop out the sky, which is often uninteresting,' she said. For a photograph of a coltsfoot's seed head, she noticed that the background was a little distracting as it was in sunlight. To make the fluffy seed head stand out better, she shaded the background with a hand. 'The trouble is, I need more hands,' she said.

What went wrong?

Babies

A popular subject, but one that is hard to photograph well. Sally Greenhill comments on these baby pictures, and offers her own advice



It's hard to know just what to change in this picture so that new difficulties aren't created in place of the old. Compositionally the baby should be held in the woman's other arm so that she doesn't obscure the baby's head when she dangles the bell; but from a lighting point of view I would move the baby a little to the right of the picture so that direct window light doesn't fall across its face.

Perhaps the best solution would be to move the baby to the right and to get someone else to hold the bell for the baby to reach for.

Another improvement would be to use a reflector to bounce some of the window light back into the faces—the woman's face already has quite a lot of reflected light coming to it from her own arm and from the baby's jumper.



The photographer has caught the baby's attention very cleverly. I always find the biggest problem when taking portraits of babies is that either you lose their attention completely when you disappear behind the camera or they make a lunge for the lens with their sharp little nails! What a pity that the harsh lighting rather spoils the atmosphere that the photographer has thus created.

I always try to photograph babies away from direct sun or window light. Indoors I sit them near an expanse of white wall with the sunlight bouncing off it—this gives a beautiful soft light which suits the baby's delicacy much better.

I think that a vertical format might have worked better in this picture. Babies' hands are almost as expressive as their faces especially when their attention has just been caught, as here.



The main problem here seems to be the angle the photograph is taken from. The line of the edge of the grass cuts across the baby's neck and there is also a patch of very bright sunlight in this area. This creates rather a lot of confusion in a compositionally important part of the picture and also means that the baby's white dress doesn't 'read' well against the white background. It is always better to arrange important areas of light subject matter against dark areas and vice versa. I would have chosen a slightly lower angle, thus positioning the head and shoulders more against the dark part of the background.

For a portrait shot like this I would probably have chosen either a 50 mm or an 85 mm lens. The wide-angle effect is rather marked here (I'm sure that the baby's feet aren't really that big!) and a longer focus lens would have thrown the background more out of focus which is more attractive for this kind of portrait.

It is a shame that the baby doesn't look a little more animated. Getting someone to play games to attract the baby's attention is often a useful ploy and you don't need to include them in the picture. For instance, 'peek-a-boo' behind the hands nearly always gets a delighted reaction from the baby and the moment of anticipation before the adult appears yet again can make for wonderful expressions. Another game which can work well is 'clap hands together, clap hands away' but here you are more likely to get the adult in the picture too.



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World of photography

Paolo Koch



Taking good pictures is only one aspect of Paolo Koch's photography. For him transforming his pictures into documents is just as vital and has given him the freedom to photograph the subjects he finds most interesting

If you often look at illustrated books or leaf through the pages of travel magazines, you will sooner or later come across the work of Paolo Koch. The secret of such widespread success is not just that Koch is a good photographer but that he is extremely good at documenting his pictures. He is very aware that if a good picture is also well-captioned it has a much better chance of being published. As he says, 'You not only have to take photographs well but you also have to sell them well'.

For Paolo Koch, the process of turning his pictures into documents is almost as important as the picture-taking itself. Indeed the ability to remain self-supporting in an extremely competitive market is largely due to the income he gets from the sale of his stock pictures. It is also due to the detailed captioning of his pictures and the extensive cross-referencing system that he has developed with the aid of a home-based computer.

This kind of thoroughness is also applied to the photography itself. If Koch is covering a subject which he feels deserves more time, he prefers to have the freedom to take that time on the spot. He may also return to a subject again and again, often in different parts of the world, if he is preparing material for a

Ancient and modern Sheep graze quietly in front of the flares which mark the Ahwaz oilfield near Abadan in Iran

book. The thorough coverage of the areas Koch has visited means that he now has an almost encyclopaedic range of pictures in his collection. The income from them gives him the freedom to travel almost anywhere shooting the stories that most interest him.

Koch started photography as a young art history student, using the camera as a sort of visual notebook. He was then travelling the world with his father, who worked with novelist and philosopher André Malraux organizing travelling art exhibitions for the French Cultural Affairs office. To help his father, Paolo started to take pictures of art and architecture for reference. Then, at the age of 22, he suddenly had to assume complete responsibility for an exhibition of Chinese art when his father fell ill. Even though he was so young, the French authorities decided he was probably the person best suited to do the job and allowed him to take over.

He found himself travelling in China at a time when few foreigners were allowed entry. It was the beginning of the Cultural Revolution and the Chinese insisted that for every museum or cul-

tural centre he went to, he also had to visit a modern factory or commune. At first this seemed a waste of time but gradually he found himself becoming more interested in contemporary Chinese life. This also affected the kind of pictures he took. Thus, instead of waiting for hours to photograph a monument so that no people were in the picture, he started to include and concentrate on people.

Even so, Koch's first pictures were very straightforward in style. As he now says, they were 'very boring pictures of places'. He sold these record shots to the popular encyclopaedia books produced by Larousse, who wanted exactly that sort of material. But his later trips also helped him make his name in photography. His pictures of the Cultural Revolution were unique because virtually no other foreigners were allowed in the country and he began to sell his photographs to some of the world's most prestigious magazines such as *Life*, *Time*, *Newsweek*, *Stern* and *Paris Match*.

This was a superb break for a young photographer but Koch realized that they were using his work because of its content, not because of his abilities as a photographer. Quite simply, he had a scoop. He was also now in a position to

receive guidance, support and criticism from some of the most influential people in the photographic world. 'In a way the Cultural Revolution, China and Mao made of me what I am today', he says. Koch's photography had also been strongly influenced by the *Family of Man* exhibition organized in 1955 by Edward Steichen for the Museum of Modern Art, New York. This helped him to think of photography for the first time as more than a mere notebook. Taking place just a decade after the horrors of World War 2, this exhibition had a highly emotional content. It was part of the general wave of support for values such as quiet family life and brotherhood. The human approach of these pictures made Koch realize that his own work could be far more personal.

The exhibition taught him to no longer think of his photography as a simple documentary tool but as a more powerful weapon. Although he is concerned to portray this aspect as realistically as possible, he does not like to embellish or falsify a mundane subject by giving it a sensational angle. He is prepared to spend a long time photographing a given subject to give it his particular interpretation. He aims to help people to understand things they would not normally be exposed to.

Koch photographs profusely, working simultaneously on several very different books as well as providing material for magazines. Nowadays all Koch's work is self generated and financed. He has worked on assignments in the past for such publications as *GEO* and *Stern*, but dislikes the constraints of the commissioning framework. Although he has done features for *GEO* on St Moritz, solar energy, recycling in Japan and avalanches, no assignment has ever really given him complete satisfaction because he cannot do exactly what he wants when working to a brief.

He stresses the importance of working in his own time and with his own money. 'If I accept an assignment, I must force myself into their pattern. But then, since I have accepted money, the magazine will sometimes hold the work back and not publish it. Then I've worked for nothing,' he says. Koch feels that seeing work published is as important for a photographer as it is for any creative person.

Taking this approach, he is free to sell his material to other magazines should the first one he approaches decide not to use his pictures. 'This way they have no right to ask why I don't have a particular image, and I have no right to ask them why they don't publish a story that they've commissioned. That is how good articles should happen—the best pictures win,' he says.

Now he only does the stories he chooses to do. As a free agent, without commitments or deadlines, he is free to change his ideas about a subject part way through a story or to interrupt one story when something more interesting comes along. For example, when he was back in China in 1979, he had to leave the

Paolo Koch/Vision International





The Indus river valley A panoramic view of the spectacular scenery that surrounds the river in the far north of Pakistan near its Himalayan source



Chuckwagon race Koch positioned himself opposite a bend in the track to capture the movement and excitement of these Canadian wagon races

country because his visa expired. The authorities would not reinstate it unless he left the country for three weeks. Instead of going back to his present home in Switzerland Koch spent the time in Pakistan and started a project photographing the Indus river.

He has already published four books, each about a different country. 'I have about 12 unfinished books,' he says. 'The world is so full of fantastic stories. I have come to the point in my travels where there is no place in the world that is not worth spending at least a month in.'

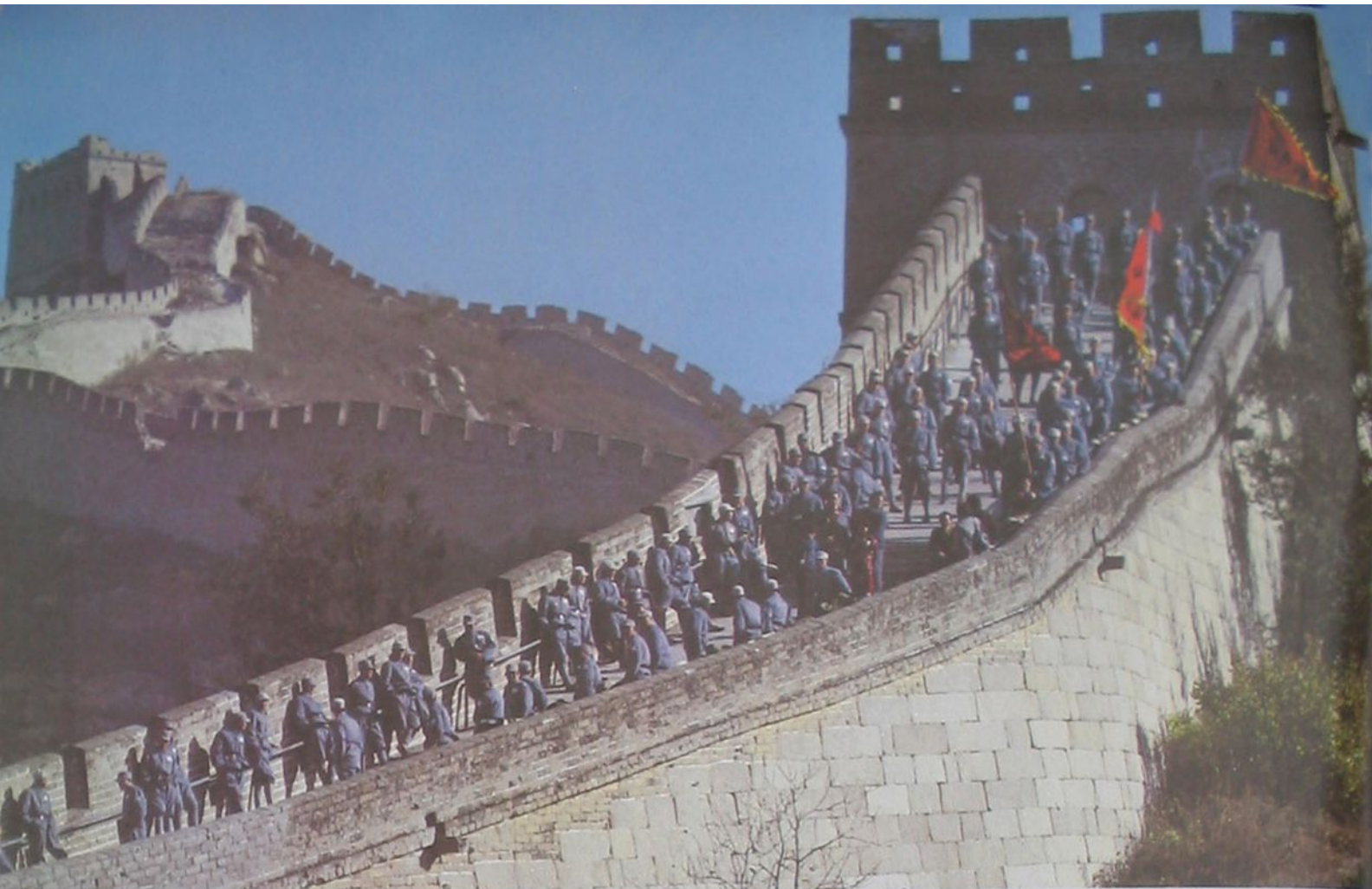
One of the books he has been working on will show the development of Buddhist iconography. He follows it from its origins in Greece to Japan, after it had traversed a continent, and shows the influences it underwent along the way. Like many of his projects, this combines his knowledge and interest in art history with his photography.

Paolo Koch has a very particular way

of selecting the pictures to be included in a book, such as one on international polo which he has been working on. 'It is the movement or the action or the sentiment in the image which decides whether or not it is included in the book, not whether the player is a famous or colourful personality. And I think that should be true of everything that one photographs.'

Koch started working on this book in a rather roundabout way which illustrates his way of working. He had developed an interest in the tomb of a king of Brunei who died in Nanking, China during the Ming Dynasty in 1406. His curiosity led him to Borneo to find out more about this king. Once there, he decided to work on a story about the whole country. He became interested in polo while photographing the Sultan of Borneo—a keen polo player who has one of the best stables in the world. As his interest in this subject grew he decided to complete the work he was doing for a book on China and launch into a round-the-world story on polo, covering its origins and the training methods in use in different countries.

Koch uses a lot of equipment. When he travels he carries a minimum of four Nikon F3s with two Nikon F2s as spares. He needs so many because he will often risk damaging a camera to get a good



Great Wall of China Chinese soldiers reenact scenes from the famous 'Long March' of the Communist Army in 1933-4 for a contemporary film

Kyosakku The hands of a Zen buddhist monk composed in the meditation posture 'awakening spirit'. By eliminating all non-essential information from the picture, Koch has created a strong portrait



complex market. It is almost impossible for a photographer working alone to keep track of the market. For example, two years after a picture of the Great Wall of China had appeared in *Time*, the Hallmark Cards Company telephoned to ask if it could be used to make a puzzle. 'How could you follow a market like that?' he asks. As a result, he uses agents to sell his work for him, servicing a few select clients himself.

'Many photographers think that an agent is somebody who takes away your money just because they take 50 per cent of a sale. But you can only sell enough to be able to finance your own photography if you have agents working for you,' he says. Besides being business people, his agents are also friends so he feels assured that his work is not sold to publications he considers utter rubbish.

He now has agents all over the world, in London, New York, France, Germany and Japan. There is also a home office in Switzerland equipped with a telex, Xerox machine and his computer which can handle over a million entries. There is also, of course, his collection of

picture. He will, for instance, readily mount a camera outside a car, or on the prow of a boat. Koch also carries a wide variety of lenses—16 mm, 20 mm, 28 mm, 35 mm PC, 55 mm micro, 105 mm, 80-200 mm zoom, 400 mm, 1000 mm and sometimes a 600 mm. He shoots an average of ten rolls of film a day, using 64 ASA Kodachrome or 400 ASA Ektachrome. He rarely uses 25 ASA Kodachrome, pre-

fering the extra speed of 64 ASA. He feels that the difference in grain between the two is minimal.

Koch is keen to emphasize that, although technical skills and good equipment are important, to be a successful photojournalist requires more than knowing how to photograph well. It is also extremely important to know how to sell pictures in a vast and

pictures from 80 different countries.

One of the great advantages Koch has given himself is an extensive captioning system. The caption for a single picture can be as much as a full typed page. If he photographs a bridge, for example, the caption will describe all the important facts about it, from when it was built, to the theory on how it works, to where it fits into the history of bridge construction. This information is very time consuming to prepare, but proves extremely worthwhile financially as his pictures are then ready to be marketed without further research. Editors return to him time and time again because they know they will get more than just a beautiful or informative picture. They will also have all the technical facts they need to use the photograph in the best possible way. It is this system, he explains, which is more or less the 'secret' of being self supporting.

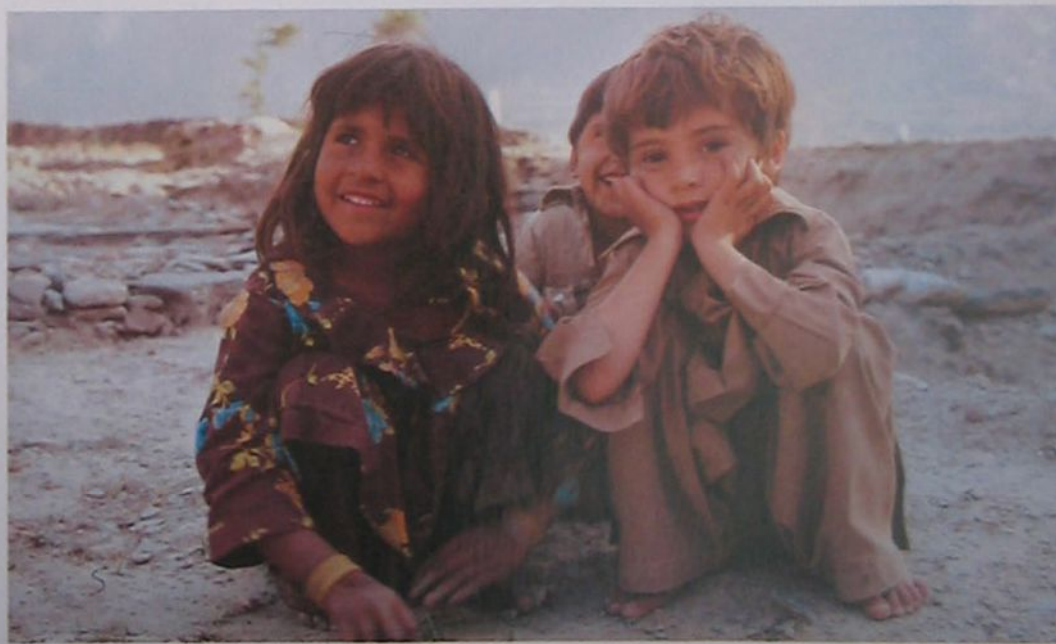
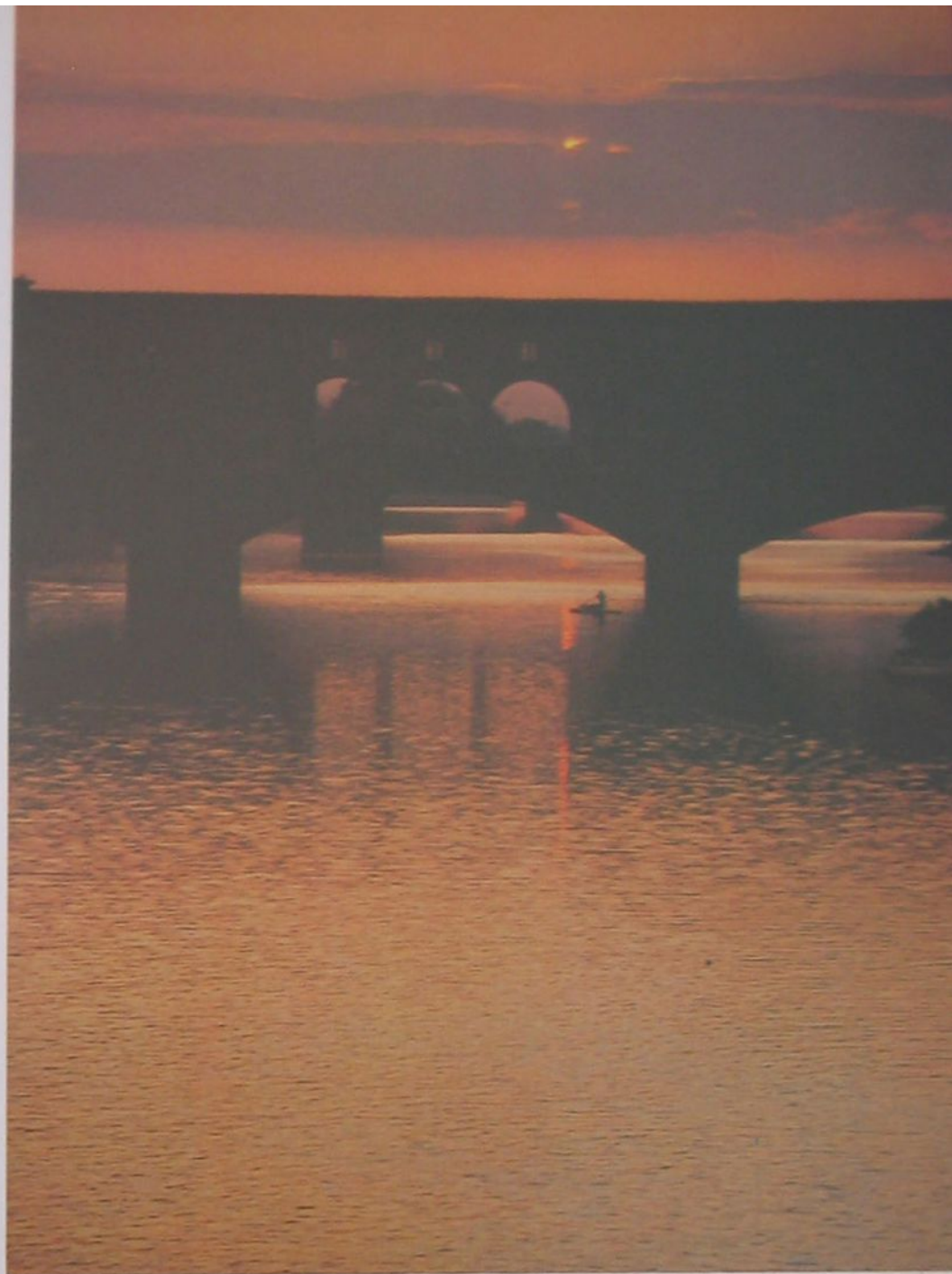
Paolo also has some of the most extraordinary pictures ever taken in their fields. An aerial picture he took of Mount Fuji was the result of spending an amount of money equivalent to the cost of a luxury car to get just exactly what he wanted—a symbolic picture of the mountain and its shadow. He took it with an 8 mm fisheye lens and says it was one of three times when the use of a fisheye lens was justified. He took 24 flights in all and had to persuade the pilot to fly exactly as he wanted him to. The resulting picture was featured on the front cover of the 1 January issue of Tokyo Time—an important publication and an auspicious publication date.

But it is probably his picture of Chinese youths waving their Little Red Books, taken in 1969, that is his most well-known and influential photograph. It has come to be the symbol of the Cultural Revolution for so many people. In this case, says Koch, the image was successful not just because it was a scoop—his photography was good by then as well. This picture has been used by countless publications since he took it. He feels confident that as many history books in the future will include the Cultural Revolution, his picture, which epitomizes the era, could well be used and keep selling for over 150 years.

The pictures that remain known throughout the years, the ones that continue to have impact, are those in which everything coincided at one point, and they express in the very best possible way that which they show, and that is why they always surface. If he can take one or two such pictures a year, he will feel satisfied, he says.

Ponte Vecchio A classic sunset over the River Arno in Florence is enhanced by the silhouette of a boatman making his way under the bridge

Children of the Swat valley, Pakistan Koch's shot points out that the fair-haired child in this informal portrait shows the racial influence of the Greeks of Alexander the Great's 4th century invading army



Understanding...

Fixing the image

After development, unwanted light sensitive particles remain in the emulsion. If the picture is to remain clear and unfogged, these particles must be removed by 'fixing'

Perhaps because people sometimes use the word 'developing' when describing film or print processing, fixing might seem to be almost a late addition to the sequence. In fact, fixing is an integral part of the process, and the fixing bath has a number of important functions to perform.

During development, developing chemicals turn the exposed silver halides into metallic silver to form the image. In this sense, development is complete. However, the unexposed silver halides remain in the emulsion. These milky silver halides reduce the clarity of metallic silver image and, because they are still sensitive to light, they darken on exposure to light so that eventually the image is

almost completely obscured. The main purpose of the fixer, then, is to remove the unwanted silver halides so that the silver image remains permanently visible.

Many fixers also have additional functions. Because gelatin softens in water, the emulsion absorbs a considerable amount of developer which is not removed by simply washing. If left, this developer residue may impair the image. Most fixers, therefore, include chemicals that render this developer inactive and also chemicals to harden the gelatin to withstand handling.

Basic fix

Because silver halides are not soluble in water, the unwanted grains cannot be removed simply by washing.

So the fixer's chief component is a chemical that turns the halides into silver salts that can be dissolved in water and easily washed away. It is important that this chemical affects only the unexposed silver halides and leaves the silver image undamaged.

Although a number of alternatives are occasionally used, such as very poisonous potassium cyanide, the chemical used to 'fix' the image in this way is usually sodium thiosulphate—often known as *hypo* because in the early days of chemistry it was incorrectly identified as hypo-sulphite of soda. Although hypo dissolves the unwanted silver halides strongly, it also has a slight solvent effect on the silver image itself—particularly in

an acid solution. If the print or film is left too long in the fixing bath, therefore, the density of the image may be considerably reduced, especially with fine grain emulsions and printing paper.

The action of hypo on the silver halides is actually quite complex, but it works essentially by turning them into colourless silver salts known as *argento thio-sulphates*, some of which diffuse out of the emulsion into the fixer, while the rest are removed by a long wash in running water.

Clearing On newly developed film, the image is veiled by opaque silver halides but the image clears as the halides are turned to colourless silver salts by the fixer



Tessa Musgrave

The chemical reaction takes place in a number of stages. The first stage is that the milkiness of the silver halides disappears, but although the image visibly clears, the compounds formed at this stage are not soluble in water. So the fixing has to be continued further until all the compounds are soluble in water. In a fixing bath that has nearly reached the end of its useful life, a film may clear but the reaction may not go to the limit and insoluble compounds still remain. This multistage fixing process gives rise to the rule of fixing a film for twice as long as it takes to clear.

Acid bath

Although plain hypo fixing baths can be used, the carry over of developer in the emulsion may result in the staining of the print. Most of the brown staining is organic, caused by the oxidation of the developer products. But significant staining is also caused by the reduction of the silver salts formed during fixing. This produces a thin layer of silver over the whole of the emulsion. The size of the grains in this fog layer is very small, in the same range as the wavelength of visible light. The effect is to make the fog appear greenish by reflected light and purplish when you look through it. It is known as *dichroic fog*.

To prevent organic staining and the formation of dichroic fog, an acid stop bath can be used to neutralize the developer prior to fixing. But it is more common nowadays to include the acid in the fixer. Acid is used because developers depend upon alkaline agents to speed up the process. Without the alkali, the action of the developer slows up considerably. When it is neutralized in acid, the developer action stops almost altogether.

This acid must usually be very weak otherwise the silver image may become bleached or the hypo may decompose into milky sulphurous compounds. If the acid is sulphurous, decomposition of the hypo is very unlikely, and the commonest acid fix baths involve the addition of 25 g of potassium metabisulphite to every litre of hypo solution. In the solution, the metabisulphite

decomposes slowly, releasing sulphur dioxide, which forms sulphurous acid in combination with the water.

Hardening

With modern films and papers which are hardened very effectively during manufacture, a simple acid fixing bath is usually adequate in temperate cli-

mates. But in the tropics, or if film is to be heat dried after processing in warm chemicals, some form of hardening is usually necessary to prevent the emulsion becoming soft. And many photographers use an acid hardening fixer all the time as a safeguard against damage to soft gelatin.

Softening of the emulsion

occurs because it swells and takes up water, particularly in the final wash. The idea of the hardener is to reduce the swelling and softening of the emulsion layer. An additional advantage is that it reduces the uptake of water and so speeds drying. Hardener also raises the melting point of the gelatin in the emulsion so that film can be washed and dried at higher temperatures.

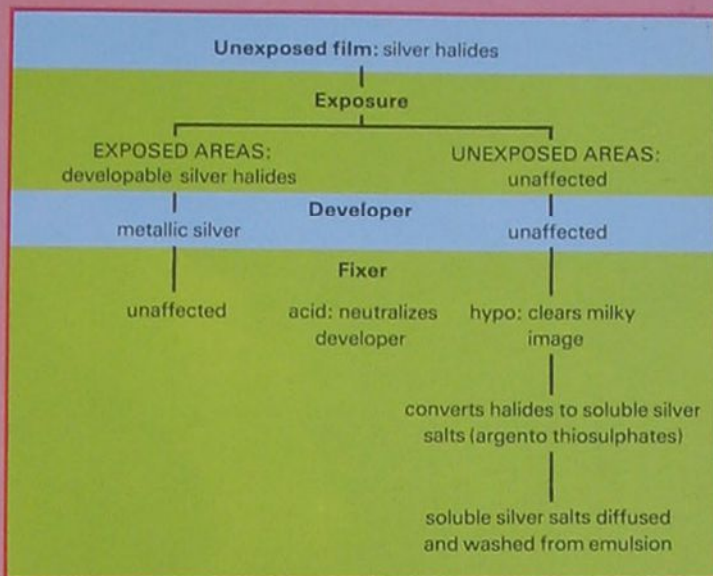
Films and prints should ideally be hardened before development, but it is often more convenient to include the hardener in the fixing bath. The most commonly used hardener is potassium alum crystals. Unfortunately this cannot be simply added to a standard bisulphite formed acid bath. The acid must be either acetic or citric acid and the balance of chemicals is absolutely crucial. Because of the precise mix required, such baths are very rarely made in the home.

High speed fixing

Used properly (see page 1922), standard fixing gives the image a high degree of stability. However, where rapid fixing is necessary and permanence is unimportant other fixers can be used.

In recent years, the use of ammonium thiosulphate instead of sodium thiosulphate (hypo) as a *rapid fixer* has become increasingly common in commercial establishments. This can fix a succession of prints and papers in under a minute. Indeed, they cannot be left in the fixer very long or the image becomes bleached.

An alternative, which uses a completely different approach, is *stabilization*. Stabilization involves the conversion of the unwanted silver halides with ammonium thiocyanate to colourless stable compounds normally insensitive to light. Because they are colourless and stable, these compounds can stay in the emulsion and do not need to be washed out. The rapid action (less than a few seconds) and the fact that the process does not involve washing makes stabilization ideal for copying documents when speed and convenience is more important than permanence. Nevertheless, stabilized prints can be fixed properly later.



Stone aged For rapid fixing and to avoid washing, photos can be temporarily stabilized, but they quickly deteriorate unless they are fixed properly afterwards





Improve your technique

Studio still life

Good techniques and imagination are the hallmarks of successful still life photography. These can only be developed through practice, but there are some basic techniques which provide a useful starting point



Simon de Courcy Wheeler

Still life photography is a subject which many people find themselves tackling at some point. The term covers the photography of anything three-dimensional, other than people or animals, which can be brought into the studio or set up as a tableau. The treatment of the subject can range from the purely recording type of shot, such as photographing a valuable vase or necklace for insurance purposes, to the artistic photography of interesting or beautiful objects which you might have collected for the purpose, such as an apple, a stone or a flower. You may become quite involved with this aspect of still life work. Many professionals carry out nothing but still life photography, in the forms of product shots for advertisements or food shots for magazines and books.

The appeal of still life work is that the photographer is in complete control of every aspect—the lighting, the appearance of the subject, the background and the angle of view. An expert can make virtually any subject look good, while on the other hand even a beautiful subject can look dull if the shot is badly set up and poorly lit. So this article covers some basic techniques from which you can develop your own approach.



Tony Stone Photo Library

Choosing the camera and lens

A standard 35 mm camera is quite suitable for still life work, particularly if you use fine grain film, though larger formats are preferable for the very best results. All modern SLR cameras focus to a reasonably close distance with the standard lens, and a macro lens is only

Simple and contrived The top picture is a classic still life—simple, natural and requiring no special techniques, it relies for its effect on colour and composition. The lower shot shows the other end of the spectrum in that it relies heavily on clever photography and an amusing idea

needed for small objects or where it is necessary to stop down to very small apertures to increase the depth of field. A mirror lock-up mechanism and depth of field preview facility are useful, but by no means essential—the mirror lock helps to avoid camera shake and the depth of field preview shows how much of the subject will be in sharp focus.

A medium format SLR, however, will invariably need either an extension tube or a close-up lens, since for many still life subjects the image will be too small at the lens's minimum focusing distance. A Polaroid back can be fitted to some cameras allowing you to check the composition, exposure and lighting before the final picture is taken.

When it comes to choosing a lens, there is much to be said in favour of a focal length somewhat longer than the standard. A longer lens allows you to get farther back from the subject and achieve a good perspective. The more space there is between lens and subject, the more room there is for lighting stands, reflectors and other paraphernalia. It also allows final arrangement of the subject without the risk of knocking things over, which invariably happens when working in a confined area. Furthermore, a lens with a longish focal length is likely to stop down further, which can be useful on those occasions when you need plenty of depth of field.

However, wide angle lenses can prove useful for some types of still life work. Sometimes it can be effective to be right in among the objects being photographed. For instance, a wide angle lens is often used when photographing architectural models, where the idea is to produce a pedestrian's eye view of the

project—indeed, drawings are sometimes made from such photographs.

Wide angle lenses used at close distances will produce a strong, dramatic perspective. This can be used creatively, but bear in mind that the 'pulling' effect towards the corners of the image will distort objects if they are situated anywhere except in the middle of the subject matter.

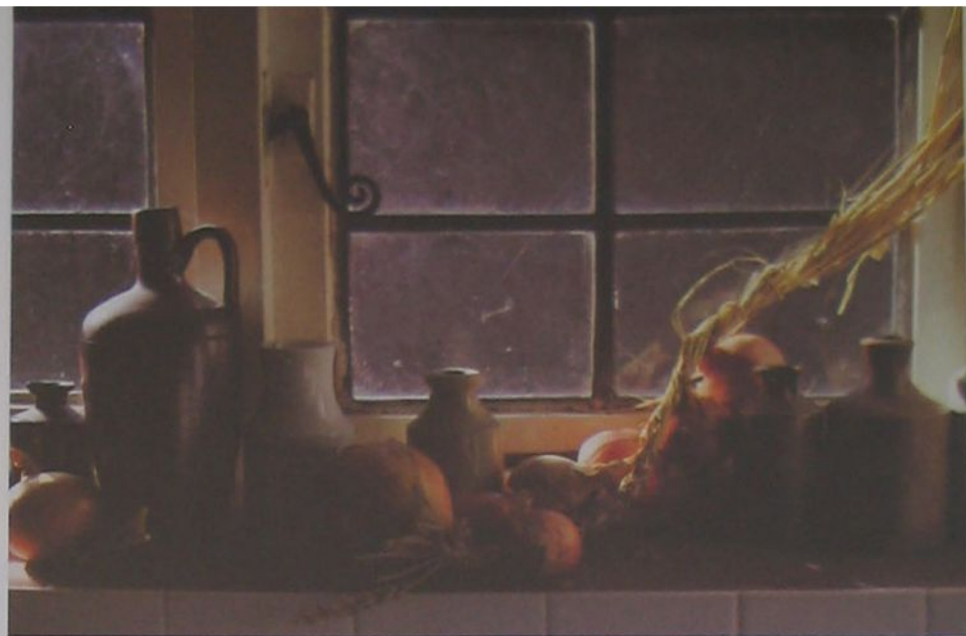
Using a wide angle lens for a still life set could well mean you will need a much larger background than for the same subject photographed with a longer focal length. Sometimes it is possible to move the background and subject closer together, sometimes it is not, in which case a change to a longer focal length is necessary.

Photographers often make use of the strongly converging perspective lines of wide angle images by using lined or

Window light You do not have to use complex lighting set-ups. With this type of subject the natural light from a window is often more appropriate

patterned backgrounds. The lines appear to meet on the horizon, which may only be a short distance away, making the subject seem somehow larger than life.

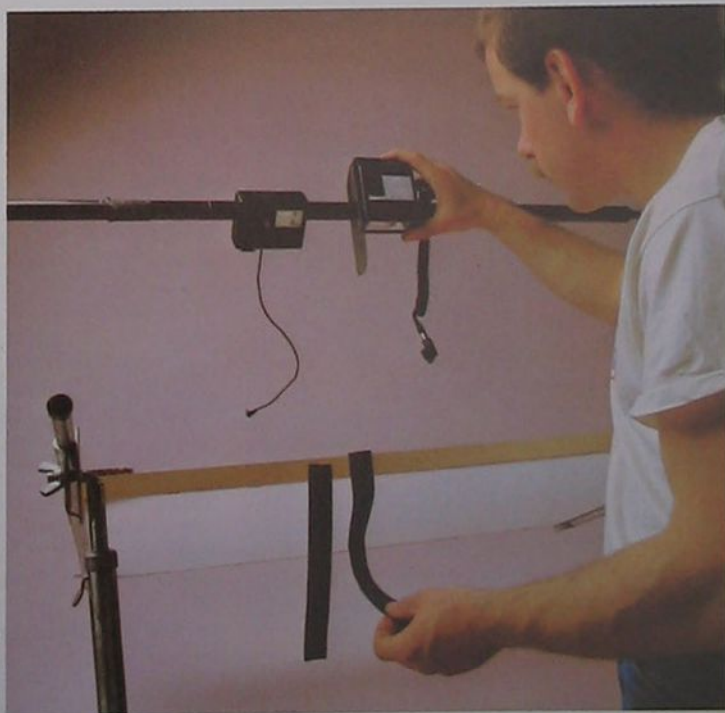
One limiting factor of still life work is that one really needs a studio. Photographers go to extraordinary lengths in order to achieve this happy situation at home. A spare room is ideal if it is big enough, but for the larger subjects a considerable amount of space is sometimes needed and you may have to take over another room temporarily. Garages, garden sheds and lofts or attics can also be used, or even just a corner of them, space permitting.



Anne Conway



Dave King



Domestic fish fryer Diffused top lighting is very popular for still life work, and it is easy to achieve even with small flashguns. All you need is a frame covered with the diffusing material clamped

above the subject (left). Two or three flashguns are then taped to a bar above the diffuser, the best positions being found by making experimental test shots



Gradual background This is the type of lighting used a great deal by professionals. Tilting the diffuser forwards (above) means that only the foreground is lit, the light fading off towards the back (right)

Keep it clean

A good deal of still life work, however, needs only small amounts of space, and it is quite possible to use a tabletop as your studio area. In this case, you may be able to use a corner of a room. But whether you are working in a studio or in the living room, cleanliness is vital.

In photographers' terms, there is nothing more annoying than having spent a lot of time setting up a still life, only to find that the transparency shows fluff, dust or a hair in a most conspicuous place. Apart from the obvious, like not smoking, keeping animals and children away, doors and windows shut, etc, there will still be occasions when dust gets in the wrong place. 'Dust off' aerosols, blower brushes and the like are very useful, but do be careful that you do not just blow dust from one part of the set to another.

Dust and fluff on velvet, flock paper or other fabrics is best removed by winding sticky tape round a finger of the hand to make a sticky brush and then picking the dust off. Some types of plastic, notably perspex, become charged with electrical static quite easily, through routine handling. An anti-static cloth or brush should be used to neutralize the dust-attracting charge. The same brush can also be used for glassware and indeed many other still life objects.

Obstinate fingermarks can be removed with surgical spirit or acetone, but as these are also solvents for some substances, especially plastics, be careful. If you use polish for cleaning, note that some leave waxy deposits which show up on film, so test for this first. Clean clear plastics only with soap and water, and dry then with a clean chamois; or use a special plastic-polish and a clean, soft duster. Some of these polishes are also anti-static, which helps prevent static build-up at source.



Choosing the lighting

Old photographic books frequently showed a bust of Beethoven or Nefertiti lit from different angles in order to show various lighting effects. A cheap modern wig stand painted light grey can be used for exactly the same thing and it is well worth expending a dozen or so frames of black and white film experimenting with different lighting angles, making contact prints, and keeping the results, suitably labelled, for future reference. Polaroids are even quicker, if you have the facility.

Front lighting is seldom used in still life work, as a very hard shadow results around the object when seen by the camera. This shadow can only be lost if the background is black. Side and top lighting are also very hard and can be used very effectively to create dramatic highlights and shadows. However, three-quarter lighting is probably the safest compromise.

All these lighting positions will give long shadows, but shadows can be reduced by moving the main light to a three-quarter position above the subject, instead of at lens level, to achieve good, basic, even illumination. Similarly,

a top light can be moved to a three-quarter position forward from the subject. But remember that two lights will produce two shadows. To avoid this, the main light to fill-in ratio should not be less than 4:1. Backlighting can be used mainly for additional effect to separate subject and background. Shadows can also be thrown forward towards the lens and look effective for certain subjects like glass, but watch out for lens flare.

Most amateur still life work is done using artificial lighting. Tungsten lighting has much to commend it, is comparatively cheap and can be metered TTL (see page 410). The disadvantages are that photofloods are short-lived and

need replacing often, and produce a lot of heat. Quartz-Halogen lamps, however, are long-lived, but they burn lots of expensive electricity and produce even more heat.

Some subjects will, of course, photograph best in daylight. Natural objects such as apples and flowers look good on a window-sill with natural sunlight streaming in through the window. Daylight has a bluish cast and you must use daylight film to get the correct colour balance. In such cases you cannot use artificial fill-in lamps as the light they throw will appear very orange on daylight film.

Electronic flash can be used very effectively for still life work. You can use it as a fill-in light when using available daylight, or you can set up the shot in the studio using modelling lights and then expose the shot with the flash. There are two main types of electronic flash and the on-camera type is virtually useless for still life work, except as a fill-in. Flash units are often supplied with accessories but rarely do these include a modelling light. Without this, subject lighting becomes a matter of luck. However, now

that 'studio' electronic flash units are becoming relatively cheaper, they are no longer the sole prerogative of the professional. Nevertheless, the initial cost of a couple of electronic heads with modelling lights can work out the same as buying tungsten lights and running them for several years.

A very high proportion of still life work can be lit with a single head and the careful use of additional reflectors and diffusers. The main light should have a large diffusing screen set some way in front of the reflector to soften the shadows. This applies equally to both tungsten and electronic light sources. The diffuser can be a separately mounted unit or a manufacturer's clip-on accessory and its size can vary between about 30 cm and 90 cm square.

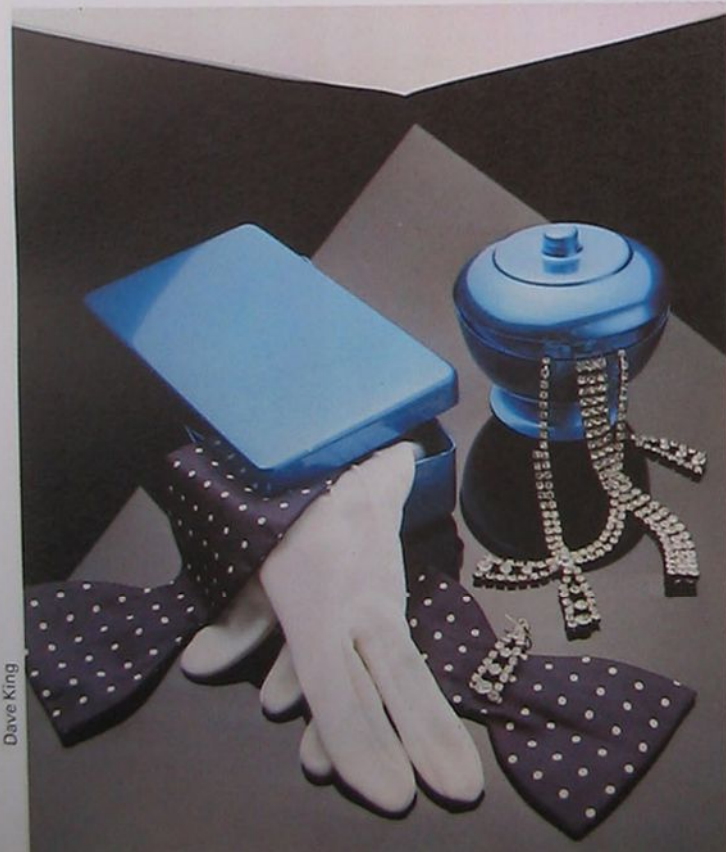
A diffuser can be made at home from an offcut of white translucent acrylic sheet or made of any Kodatrace type of sheeting fixed to a frame. With tungsten lighting, allow a good distance between lamp and diffuser to avoid any fire risk. It is also possible to use a silvered umbrella as a single soft light source in either reflector or diffuser role. In practice, you may find this set-up rather clumsy within the confined area of a still life set.

Should the subject lend itself to hard lighting, or you require sharp shadows, then use a standard reflector (or spotlight) without a diffuser, and allow a large distance from light and subject.

Setting up the lighting

Since the 1960s, professional photographers have had a strong tendency towards top lighting still life subjects. Bearing esoteric names like Swimming pool, Hazy light and Fish fryer, their top lights are simply large sophisticated equivalents of the diffusing screen

Ed White



Dave King

Vanishing trick

To give the effect of a large space in the confines of a studio, the boards used above were made in miniature and tapered, giving a result similar to an ultra-wide angle lens—even though an almost standard focal length lens was actually used

Reflected light

If you use a reflective background the lighting will form an effective part of the background. The bright patch here is a reflection of the fish fryer flash diffuser—part of which can be seen at the top of the picture

already mentioned. Most need an expensive and heavy boom light stand in order to support the weight. Where domestic conditions allow, it is possible to have hooks in the ceiling to support heads and a frame. Otherwise, a length of electric conduit between two stands may be sufficient. These stands can be base weighted for safety with house bricks in a plastic carrier bag.

Still life subjects benefit greatly from a 'falling off' or gradual darkening of the background. The prime requisite is for sufficient space between subject and background in order to effectively throw this area into shadow. Camera viewpoint affects the position of the soft-edged horizon. A fall-off background can be achieved by masking the main light from the background with black card or board. This mask is placed forward of the main light or, in the case of top lighting, on its backedge. A coarse, saw-toothed edge to this mask will soften the line of its shadow.

The full range of lighting techniques for still life is dealt with in part two of this article (see pages 2140 to 2144—see also pages 1613 to 1616 and 1883).



Creative approach

Beside the seaside

Whether your interests are in photographing seascapes bathed in dramatic light or candid shots of people at play, beachside resorts offers unlimited subject matter

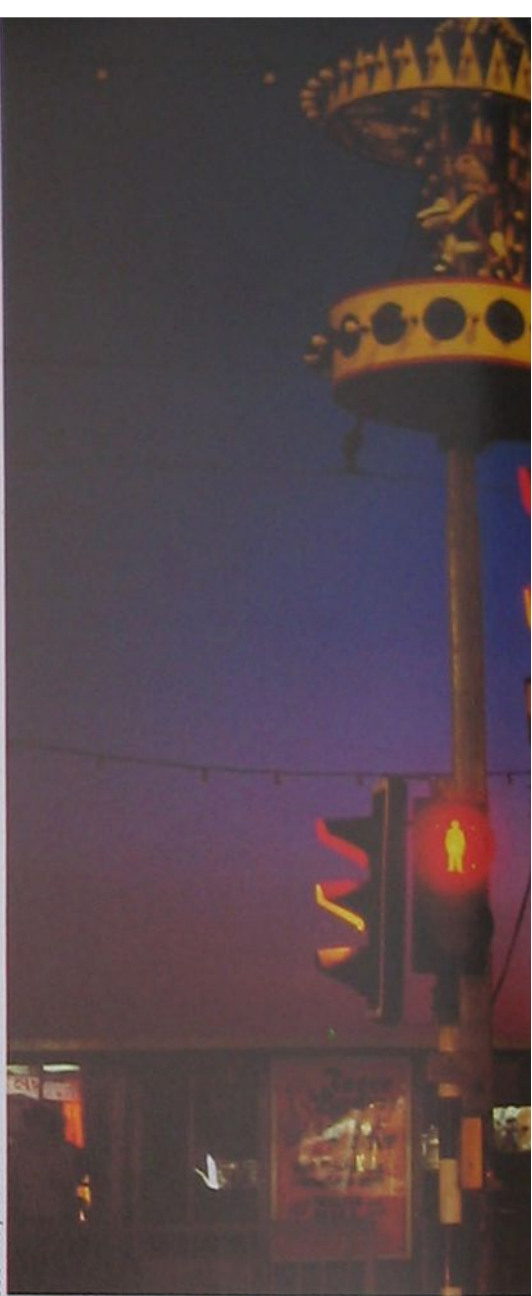
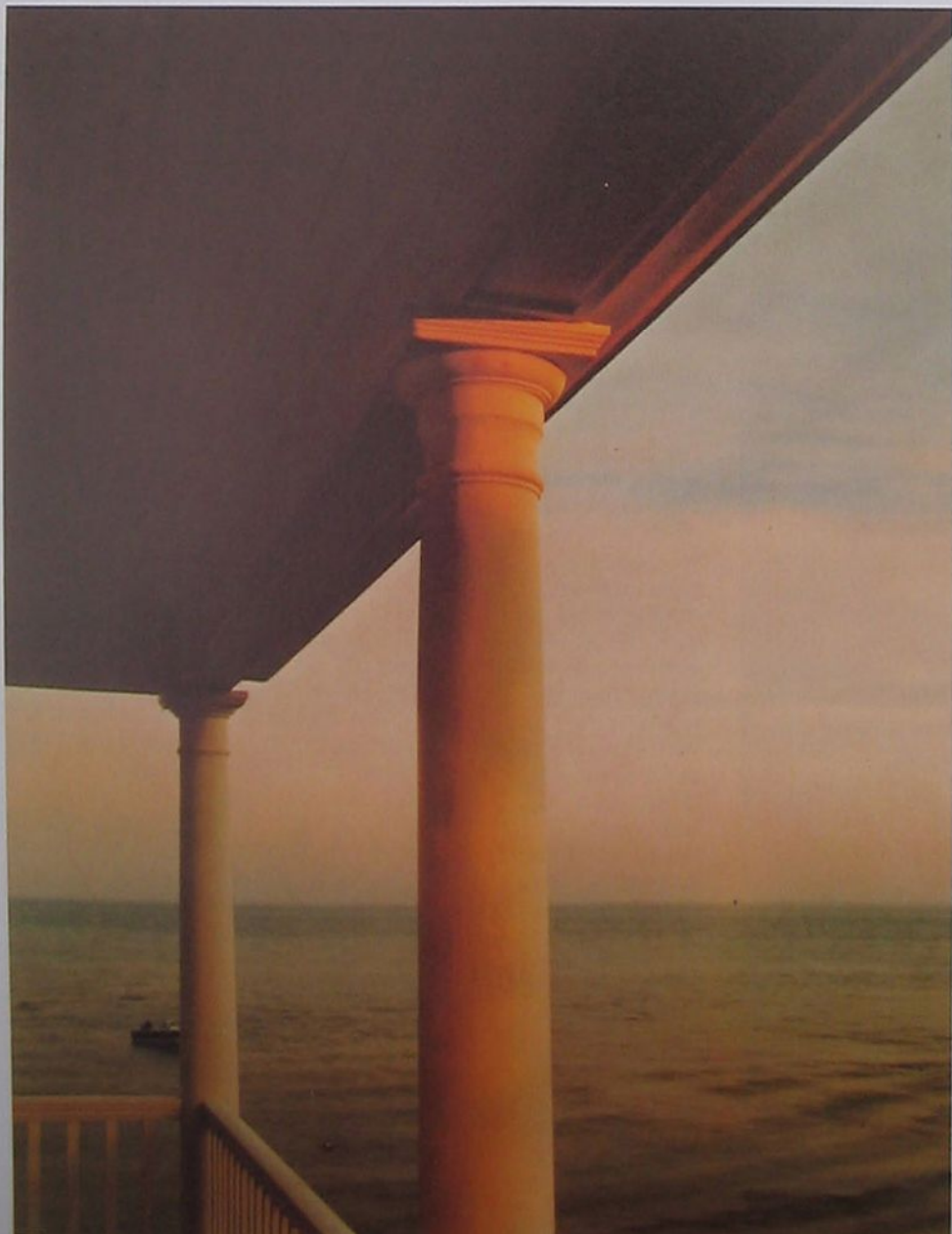
Seaside resorts are perennial photographic subjects; with their seasonally changing faces and moods they always seem to have something new to offer. Yet it is surprising how little is made of creative opportunity at the seaside over and above the standard holiday snaps, especially during the summer months when such places are alive with potential images almost everywhere you choose to look.

The changes that take place at the seafront can be dramatic—a small area of beach is overcrowded with hundreds of well oiled bodies pressing down on the sand in summer, but during the winter it becomes a barren expanse of wasteland—grey, windy and forbidding. Similarly, a pier amusement arcade echoes to the screams of excited children and to the cacophony of electric

games when the season is at its peak. In winter the blistering wind peels away the paintwork from the boarded-up doors and the gaudily painted phantoms of amusements stare bleakly out to sea—faint patches of colour against an expanse of grey.

But all this is excellent material for photographers. At any season, at any resort, there is a rare mood that can instill your images with the nostalgia conjured up by the trappings of happy times and by the associations these places often have of the bucket and spade days of childhood. A resort need not just be photographed during the

Porch A resort area is full of subjects that can be photographed purely for aesthetic reasons—their shapes and the way the light plays on them



Joel Meyerowitz

summer as part of a holiday—think about returning in winter and immersing yourself in the dreary atmosphere of a chilly grey day by the sea.

To someone who does not actually live on the coast the appeal of the sea can lie in its vast, intimidating nature, especially in winter. The atmosphere of the sea is unique and the photographer places himself or herself at its whim. A decision to go there and take photographs does not even necessarily mean that you know exactly what you are going to end up with. You go there to steep yourself in its character and to end up with a photograph with a particular feel.

On the beach alone there are numerous photographic opportunities. The rippled contours in the sand caused by a receding tide can be used either as a subject in itself or to lead the eye—perhaps to a solitary figure walking along the water's edge. Low sunlight and a low viewpoint will make these shapes more pronounced and if you photograph the beach when the sand is still glistening with the previous receding tide, further impact can be achieved—especially at evening.



Chris Steele-Perkins/Magnum



Beach lights The dramatic colours of a western sky at dusk makes an ideal background for shots of seaside illuminations. **Pier** Although the day was misty and overcast here, the photographer used two graduated filters—one inverted—to colour both the foreground and the sky

John Sims

When photographing the beach there are obvious shots which present themselves to the camera. Holiday-makers, installed in deckchairs, lurking behind windbreakers or lying in tight formation across the sand, can make good subjects. But for a more creative interpretation of the scene, try and find a different viewpoint which offers a fresh view of the commonplace. Crouching behind a deckchair and photographing from a low angle with a wide angle lens can be effective—especially when including colourful fabric and shooting into the sun. A high viewpoint can also give a more unusual view—perhaps shooting down on to the beach from a pier and using a long focus lens to compose a graphic shot of sun worshippers lying in the sand or looking



the generally horizontal scene.

To respond to the varied mood that can be created by a coastal resort, you do not necessarily have to visit the place at different times of the year. The light prevailing near the sea can change quickly and dramatically—even in a single day. These subtle or dramatic changes are what an experienced photographer will seek in order to bring more atmosphere to an image. In his book *Cape Light*, American photographer Joel Meyerowitz took several different shots of exactly the same view in Cape Cod, but all under different lighting conditions. This 'Bay/Sky' series shows dramatically how the whole scene can alter—not only tidally but also because of remarkably different light.

When applying landscape principles to photographing a stretch of beach, think in terms of photographing from a distance, as well as from the beach itself. A view from some adjacent cliffs, or from a boat at sea, may offer something out of the usual. Cliffs are particularly well suited as viewpoints and will often allow you to photograph the beach, rows of

down at a single person sitting in a chair.

A totally different approach that may also be worth trying involves applying a more landscape oriented technique. Here you will find long focus lenses especially useful to isolate bands of sky, water and sand to produce an abstract effect. Often a beach will feature rows and rows of groynes which can also be incorporated into a landscape shot—exploiting the effect of compression that a long focus lens will create. In such vast expanses of sky, beach and water small features can be used with great effect—a distant boat or a solitary figure on the beach will be given dramatic prominence if it is the only vertical to break up

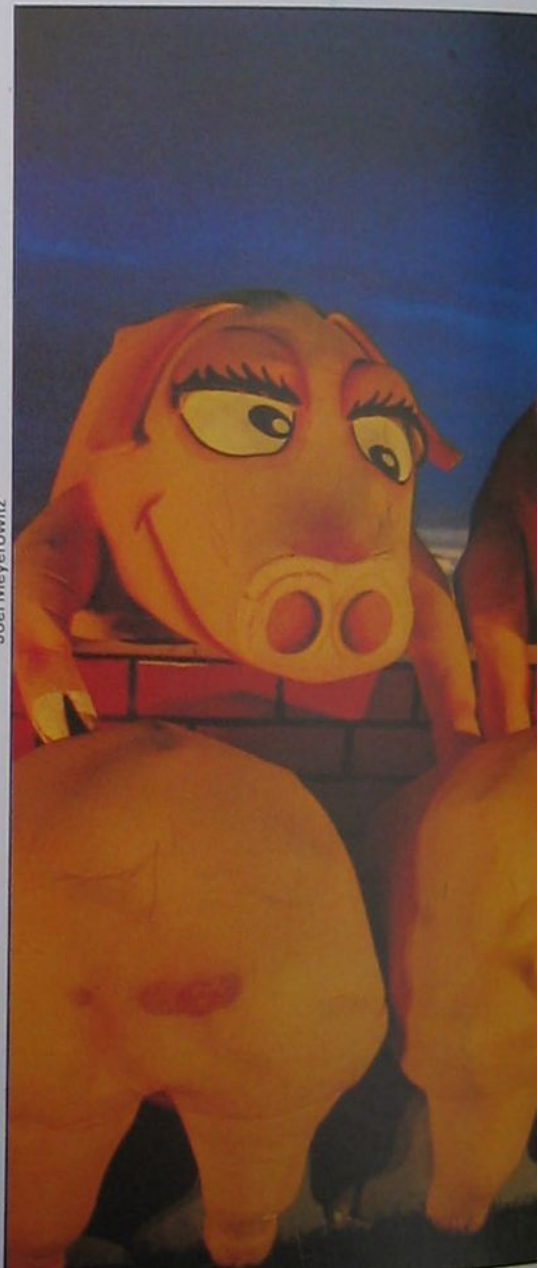
Bay and sky in sunshine This shot is part of a series which highlights the way the changing light alters the entire appearance of the scene—compare it with the same scene shown below

Illuminated pigs The orange cast from the tungsten lighting made this shot even more bizarre and the light on the pier amusements contrasts with the dramatic sky in the background

Bay and sky in storm The menacing, oppressive feel caused by the stormy sky showed this scene in a totally different light. A wooden, large format Deardorff plate camera was used for this series



Joel Meyerowitz



Beach scene This shot is made by one critical moment the photographer chose to shoot—the dog in mid-air while everyone else was heading away

beach huts and hotels along the sea front as well as the town itself, huddled up beside the coast.

In attempting this approach to photographing resorts you may well find that it is a subject highly suited to experimentation with different filters. On bright, sunny days, the divisions of colour between the sky, sea and beach will be more pronounced if you use a polarizer. On grey, wintry days you may find that your colour pictures will appear weak if the pale sky occupies much of the frame. This will be corrected if you try using a graduated filter—either blue to give the illusion of a summer's sky, or perhaps pink to completely alter the mood and appearance of the scene. A dull overcast day may also be an ideal opportunity for experimenting with slow shutter speeds to render the movement of the waves as a delicate mist. This can be combined with filters also—perhaps

Marketa Luskova



going all the way and using a pink graduated filter to colour the sky and an inverted blue graduated filter to give more colour to the sea. Of course there is never a substitute for the real thing and whenever possible, try and take your shots early in the morning or evening when the natural light invests the scene with colour and atmosphere.

A coastal resort is also an excellent location for taking a more documentary approach to the surroundings. You may

Wading in the waves Another example of waiting for the right moment—the girl looks particularly determined despite the looming waves

John Benton Harris





Two ladies At a seaside resort there is usually endless scope for candid photography—people are too involved with what they are doing to notice



Cricket Black and white film is particularly suited to capturing people absorbed in their recreation—here the photographer noticed the woman at her game and waited to find exactly the right viewpoint and timing. **Changing** Look out for priceless humorous moments like this—and try to anticipate the best moment to shoot



decide to visit a highly popular resort at the height of the season to shoot black and white scenes of holiday makers having fun. Some of these resorts may be less than exotic and even in summer there may be only occasional glimpses of the sun. Look for intrepid holiday-makers huddled up on the beach, determined to be there when the sun finally appears. This approach can also be applied to pier amusements, casinos, or figures walking along the promenade. From muscular males demonstrating their prowess to youngsters enjoying the sand and sea, you will find that a beach offers endless scope for excellent candid photography.

Colour film is particularly well suited to this aspect of resorts as well. A row of colourful beach huts or boats upturned on the beach can be isolated to make a study in pure colour. The same sort of treatment that a fairground calls for (see page 1932) can be applied to the amusement arcades on a pier. Piers themselves are highly suited to photography—in both colour and black and white. In many areas they are disappearing rapidly—often their ageing structures are no longer strong enough to withstand winter gales. From graphic studies of their lower structure to compositions that concentrate on the bright colours of pier buildings or rotting and corroding woodwork and wrought iron, there is much scope in trying to capture the fading glories of the past.

The same storms that endanger amusement piers around the world also bring benefits to the photographer. Before and after a storm it is quite common for the coast to be enveloped in dramatic light. Combined with the dark, forbidding sky, rays of light penetrating the gaps between the clouds can show objects or buildings individually lit by these strong rays of light but set off against a black, ominous sky.

Another feature of a heavy storm is the turbulence of the sea and the debris that is often washed up afterwards. Huge waves lashing a quay or breaking upon the beach can yield powerful photographs. Always protect your camera from the salty spray that hangs in the air under such conditions and try to frame your shots so that there is more than just the sea included—more of a sense of the sea's power and of the size of the waves is conveyed if you include a group of rocks or a jetty.

After a storm, the debris washed up on the beach or promenade can give you the chance to photograph something unusual. A stray shark or octopus may well be washed up on the beach—try using a wide angle lens to frame the creature in the foreground with the waves receding away in the background. Twisted driftwood or pieces of wreckage can be photographed in a similar way.

No matter what your interests are, both in photography and generally, you will find that coastal resorts offer extremely broad scope for creative photographs.

Ian Berry/Magnum

Ian Berry/Magnum

Sirkka-Liisa Kontinen



Sirkka-Liisa Kontinen

Woman and dog
People seem to love taking their dogs to the beach and these can make good subjects themselves. Here the photograph combined the pleased expression of the woman with the amusing antics of her dog and the beach itself as a feature

Sunbather A busy resort is often full of people who will react in an exaggerated way to the sight of a camera. These gestures can make very striking photographs—once again, black and white film is ideal for this

Elliott Erwitt/Magnum



Drying prints and film

Although often taken rather too much for granted, film and print drying is an important part of the overall processing routine, demanding careful techniques, and should not be skimped or unduly rushed

Drying is often overlooked as a tedious finale to more critical stages of film and print processing. But, as any professional will tell you, drying is not just a matter of stuffing films or papers into a hot airing cupboard for an hour or two.

The purpose of drying is to dehydrate a print or film emulsion saturated with water, leaving it with a residual moisture level—even when 'dry'—at which it remains stable and safe for storage and normal handling.

Film drying

Whatever method of drying you intend using, first give films a final rinse in wetting agent, which lowers surface tension and allows faster evaporation. Do not use washing-up detergent as a substitute for commercial wetting agents, such as Agepon or Photoflo, unless you can keep the concentration very low—a drop or two is quite sufficient even for a sinkful of rinse water.

To air-dry films, first remove excess water from the surface of the film. Use a

chamois or sponge to wipe the film but take care not to scratch the film with dirt which can be trapped between the film and the sponge.

This applies to using a film wiper blade or squeegee but there is less risk of damage if it is kept and stored cleanly and soaked in hot water shortly before use so the rubber blades are soft and flexible.

Many people prefer to use a finger wipe as any grit on the emulsion can be detected by the sensitive tips of the finger and the film can be rinsed before damage is done. Dip the fingers of one hand in rinse water, hold the length of film up with the other hand and use the first two fingers of the wetted hand to wipe the film. Start at the top and slowly run your fingers downwards.

Work over a sink or tray in case you drop the wet film and be quite sure that the emulsion side is facing your second finger. The key to success is to be able to use a light, smooth contact—not a gripping pressure—maintained evenly

down the length of the film.

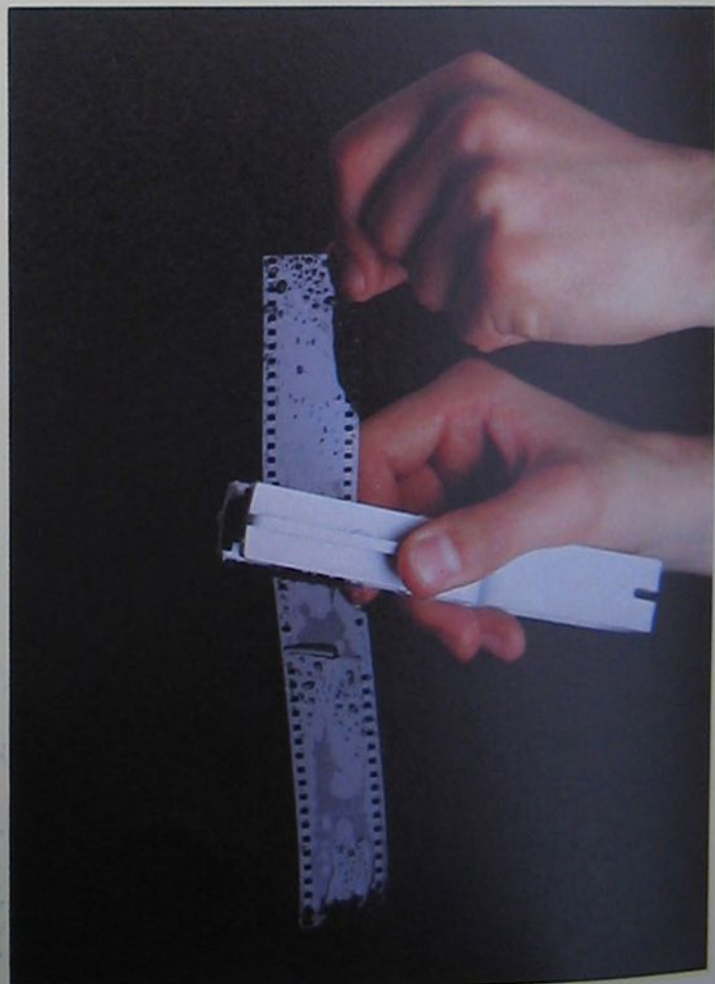
Use pin type clips to hang films to dry where possible, as they do not hold droplets like some types. Weighted clips will keep your film straight during drying, leaving dried films which do not have a natural curl. Dry your films in a well ventilated but dust free area—a bathroom is often ideal.

Films should be cut and filed as soon as possible after drying.

Forced drying

Films are often needed quickly after processing and heated dryers can be used to speed drying. But hot air is less humid than air at room temperature so too high a drying temperature will result in moisture being removed from the emulsion surface very quickly, and leave the subbing and other lower layers still wet. Severe overheating can cause stresses which may in turn lead to *delamination*, or separating of the film layers.

However, heated film dryers are a real



Home-made drying cabinet A simple 'hot box' film and print drying cabinet can easily be constructed at home—you may even be able to convert an existing cupboard. Although this design relies on tungsten bulbs for heating, a filtered fan-heater could be used. The print racks are stored in the base when film is being dried then racked in the cabinet below ready for use

boon in a busy darkroom (see page 2058), but you should follow the maker's instructions closely. You can make your own using a small cupboard heated by a tungsten bulbs, employing a fan and filter system for greater efficiency. The lack of excessive heat will help your film dry 'naturally', so increasing its stability and permanence. This cabinet could be designed to accept prints also.

Rapid drying

Drying can be speeded up by immersing film in a solution of eight parts industrial meths to two parts water for not more than five minutes, otherwise the film base may start to soften. Do not use undiluted meths as the emulsion will become cloudy and the base distorted. Using meths is not a recommended procedure unless the circumstances are exceptional, and rewashing and proper drying are needed as soon as possible afterwards to limit the risk of cracking the emulsion.

A proprietary methyl alcohol is available for the same task. Tetenal Drysonal rapid dries film within two minutes by accelerating the rate of evaporation. No rewashing is said to be needed—you simply immerse the film then dry it. This reusable liquid may have a hardening effect on the film, like meths. It is a handy thing to have on your shelf, though.

Drying marks

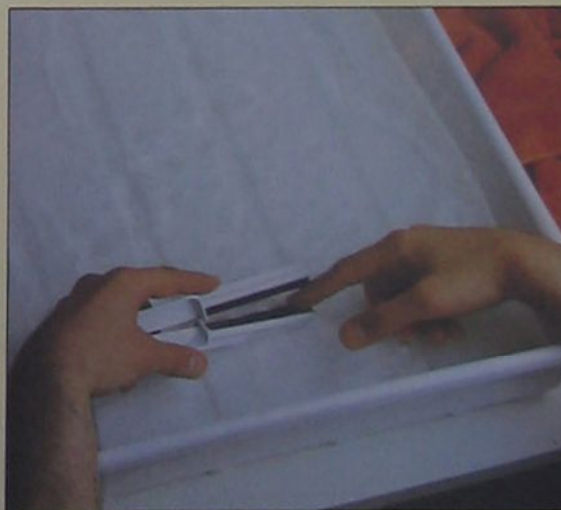
In hard water areas, lime marks left behind after droplets of water have dried can be a problem—especially when wiping down is inadequate. Overcome this by immersing the film in a one or two per cent acetic acid bath for a couple of minutes before drying. Photoflo and other wetting agents should not be used or reticulation may result since they are alkaline.

Finger wipe A finger wipe will remove a good deal of surface water—but there is always a danger of local accumulations

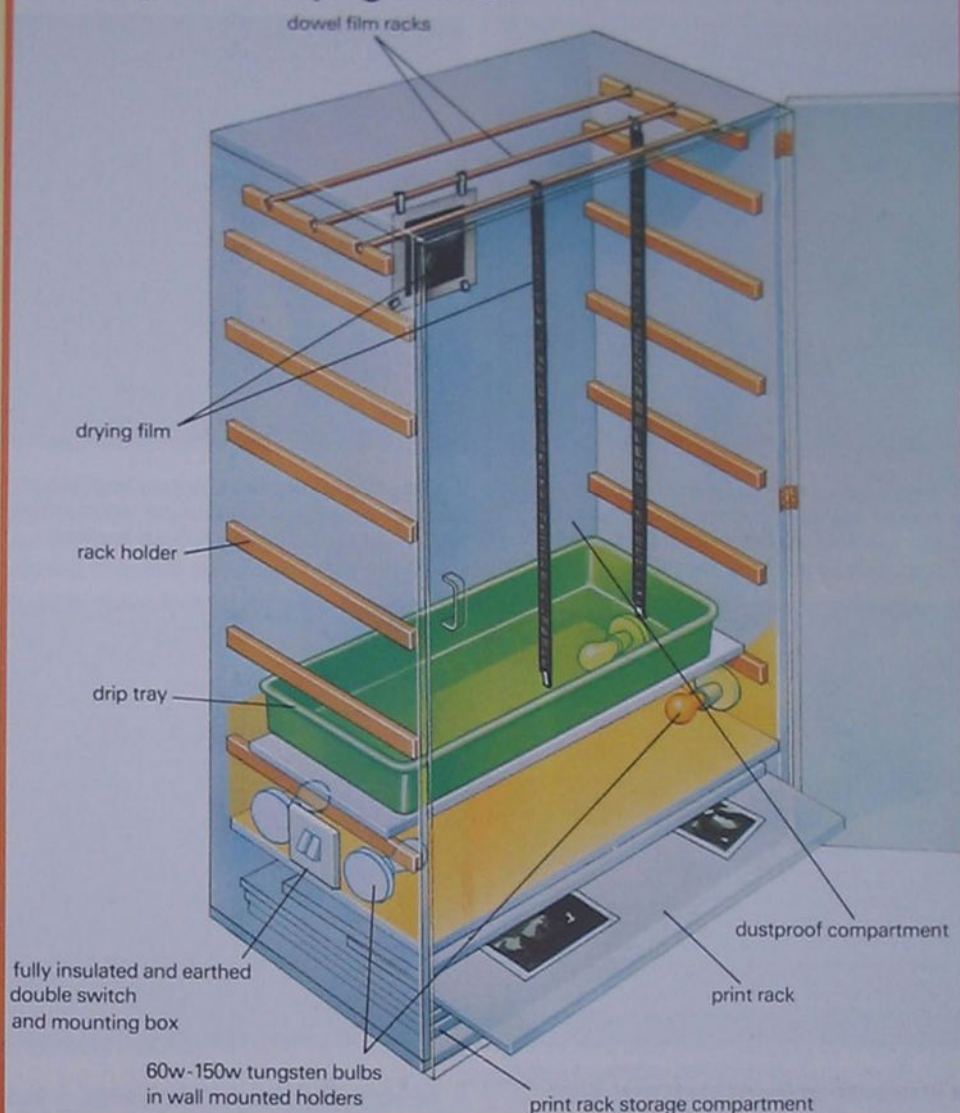
Film wiper A film wiper blade is the most efficient method of removing surface water, and helps reduce the drying time

Wetting agent bath Always give films a quick rinse in a bath containing wetting agent, or just a drop of detergent

Cleaning wipers Film and paper wipers should be rinsed before use. Inspect the blades for the presence of grit



A simple DIY drying cabinet



Drying papers

Prints should be dried in air for archival storage (see pages 1922 to 1925). But this can take a long time and it is common practice for normal work to speed up the process by using an electric fan, hair-dryer or drying cabinet. Heat drying RC paper gives a higher sheen but this applies to semi-matt and gloss finishes

especially. Wiping prints down with a sponge or print squeegee helps considerably since water on the surface tends to form droplets which slow down natural drying and can mark prints being dried with heat. Resoaking and drying may correct this.

RC papers can be put on to drying racks and then left in a warm dust free

Glazing procedure (cold method)



1 Procedures for hot or cold glazing are virtually identical but the economy of the latter method makes it ideal for the odd print. Start by soaking the print



2 Carefully clean the glass (or the glazing plate in the hot method) using warm water and detergent. Then polish the surface clean and dry



3 Either place the entire sheet in the dish containing the print or, as here, at an angle to it. Slide the print emulsion into contact with the glass (or plate)



4 Use a flat squeegee blade to remove excess surface water and to bring the print into firm overall contact with the glazing surface



5 You may find that a rubber roller squeegee is more effective for pressing the print flat. Either way, work from the centre outwards in all directions



6 Finally, place a sheet of blotting paper over the print and weigh it down lightly. At this stage a metal glazing plate would be placed in the dryer if using the hot method

place. Alternatively, RC prints may also be passed through a specially made radiant heat dryer—or simply fanned dry with an electric fanheater or hairdryer.

Glazing prints

Fibre based prints can be dried naturally in air (see page 325) but it is often much more effective to glaze glossy-surfaced material—especially for presentation work. The real value of glazing is that it yields an obvious extra sparkle to prints. Depth of blacks is also improved. The glaze is very delicate and care must be taken to avoid contact with all forms of moisture, fingerprints included.

There are two types of glazing machine, flatbed and rotary (see pages 2058 to 2060). Both work on the principle that a glossy surface of a print, held and dried in close contact with a smooth polished surface, will assume the same smooth polished finish. The polished surface of a glazing plate must be kept scrupulously clean. If it is not, marks will

transfer to the print surface, resulting in a pitted glaze which can ruin the effect of an otherwise perfect print.

If you are using a flatbed glazer, begin every glazing sequence by thoroughly cleaning the glazing plate. Polish off rough deposits left after a warm water and soap wash by nothing more abrasive than French chalk, or use your finger tip, then rewash the plate in warm soapy water and rinse briefly. Blot the plate with absorbent paper or towel. Using a soft dust-free cloth, fine polish the plate with gentle circular action.

Place prints to be glazed in warm rinse water, free of impurities—filtered or distilled water from the kettle is ideal—and add a drop or two of wetting agent or washing-up detergent. Allow prints to soak for a while. Always be sure your prints are thoroughly washed before glazing or stains will result.

Then place the glazing plate in the same dish as the prints and slide the latter on to the plate while both are under water. Remove the plate and prints from

the dish to a suitable worktop. Use a sponge or towel to mop up surplus water and, using a flat squeegee blade, squeeze out water from between the prints and plate, taking care always to work outwards from the centre of each print. Mop up surplus water as you go. Transfer the glazing sheet to the dryer, and position it beneath a correctly tensioned cloth apron. Set the thermostat according to paper type—but as low as possible—and switch on the unit.

It remains now only to wait long enough for drying to be completed. It is very important not to rush this stage, and if you lift the apron too soon you may get localized increase in drying, or print lift, the combination of the two resulting in 'oystershell' marks. This is where the glaze is physically broken in progressive and numerous lines as the slower drying areas of the print are gradually released from the plate. This can be prevented by beginning glazing without heating, then retaining the apron pressure well beyond the expected

drying time of the print when the unit is eventually switched on.

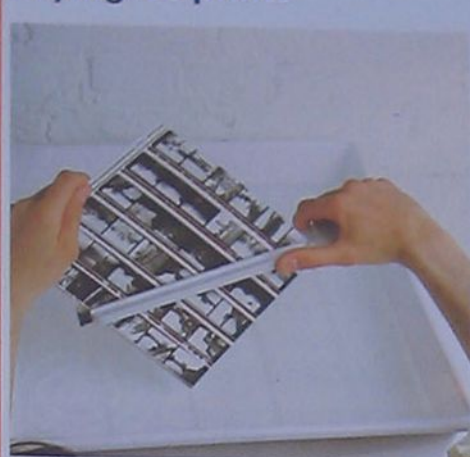
If glazed prints are badly pitted—a frequent problem when wet prints are laid directly on a hot, dry glazing plate, and badly squeegeed—resoil the print again, and reglaze.

Occasionally prints will stick to the plate. If this happens, allow the plate to cool and, if prints stay fast, return the plate once again to the warm dryer. If this does not move it, submerge the plate in warm water to soften the emulsion and then peel off the print after a generous soaking period. If parts of the print emulsion remain stuck despite this, use your fingernail to lift up a corner gently and peel off the emulsion. Using more force than this may cause scratching on the plate. This, in turn, leads to poor quality glazing and increased risk of sticking, so a scratched plate should be replaced as soon as possible.

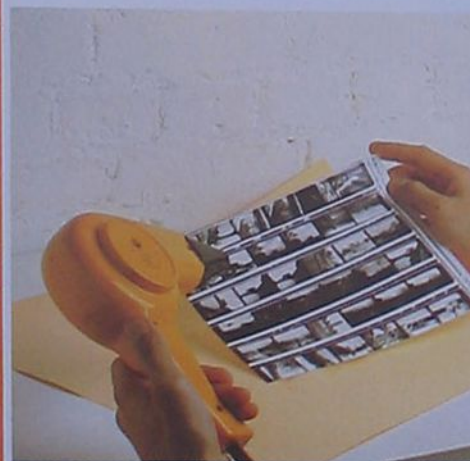
Cold glazing is an alternative method but takes longer, and you follow the same procedure except that you need not use hardening fixer. You can buy glazing fluid for this method—your print is soaked in it before being placed into contact with the glazing sheet which has also been wiped with the fluid. This helps promote drying, ensures a good finish and prevents sticking.

You must use a fairly thick (4 mm plus) sheet of good quality plate or float glass to cold glaze your prints. As a precaution this should have its edges ground smooth so you will not cut yourself when handling it. Clean the glass with warm water and washing-up detergent, rinse, let it dry in air (towels may leave lint) then wipe it down with glazing fluid and soak your print for the recommended time. Lay the glass flat or at an angle in a dish of water, and slide the print on it, emulsion against the glass. Remove the glass and print from the dish. Use a squeegee to make good contact overall.

Drying RC prints



A special print-sized wiper blade can be used to remove excess water from RC prints, to further reduce the already short drying time that these need



Left to air dry in a warm room, RC prints should be dry in about 15 minutes. This can be reduced by using a fan heater or dryer held at a safe distance

Lay the glass, print on top, on the table and put two sheets of photographic blotting paper on the back of the print. Weigh this down with several newspapers, or weigh down just the corners.

Leave it for at least a day—two if possible—and then peel off the blotting paper. If the print does not lift away from the glass, do not attempt to tease it off or you may cause damage.

Glazing machines can be used to dry fibre based prints regardless of their surface. Simply wipe the excess water from the face of your print and place it on to the glazer without glazing solutions, with the emulsion towards the blanket and the back towards the drum or heated surface. Check it every few minutes if you are using a flatbed machine and it will soon be dry. Never put RC papers on a glazer for drying unless the temperature is well below 90°C, otherwise the coating will melt.

Print curl

Sometimes fibre based prints can curl in drying. This can be cured by drawing the print backwards over a table edge with the emulsion up. The angle between the paper and the edge, and the pressure applied, determines by how much the curl is reduced. Take care not to bend it too far back or the emulsion may be torn or cracked.

If your fibre based prints are dried in air, and have wavy edges as a result, then damp the edges on the back of the print until they begin to go soft. Hold some photographic blotting paper in front of a fire until it is dry and almost scorching, then lay it on the back of the dampened print and sandwich the two between flat surfaces, like thick sheets of cardboard. Apply gentle but firm pressure until the print has dried. Another method is to put your prints into a warm dry mounting machine under pressure for a few moments then release. Repeat until the print is flat.



Heat drying A glazing machine can be used to dry and to glaze fibre based prints, and—at lower temperatures—to dry RC prints

Curing curl Fibre-based prints which curl during drying can be straightened by drawing the print across a straight edge



Roger Payling



Equipment file

Old rollfilm cameras

The modern rollfilm camera evolved through a series of outstanding designs, some of which have never been bettered. Many of these classic cameras are not only prized collectors' items but also eminently usable

the first category includes those cameras dating back to the prehistory of rollfilm—before 1895. For 60 years after that, there were two types that formed the backbone of rollfilm camera production and accounted for most rollfilm camera sales: the box camera and the rollfilm folder (a folding design). Next came the reflexes: twin-lens and then single lens. Finally, there is a residual category, which includes such eminently usable cameras as the Kodak Medalist and Fujica G690 rangefinder cameras, as well as such rare delights as the Thornton Pickard Machine Gun Camera, used for training World War I airgunners.

Pre-1895 rollfilm cameras

The chances of acquiring pre-1895 rollfilm cameras are extremely small, but the rollfilm concept goes back a long way. Rollholders using paper-negative material were known as early as the 1850s, and the first Kodaks (1888) used *stripping film*, in which the emulsion was stripped off its paper support after development and transferred to sheet glass or thick gelatine for printing. In 1889, the Kodaks were converted for transparent film. In 1891 came cartridge loading, with modern-style backing paper, and the red-window, numbered backing paper system for counting exposures was introduced in 1895 to usher in modern rollfilm.

The earliest rollholders were simple adapters for plate cameras, but the viewfinder-less 1888 Kodak was the first of a long line of box cameras using rollfilm. In itself, the box camera covers a wide field, but enthusiasts tend to specialize. The only much sought-after boxes are those dating back before 1900

Rollfilm cameras from 1933 to 1939 These black enamel and nickel finished items were made by Kodak, Zeiss and Heidecke. Today, only the Bantam and the Rolleicord are collectors' items

Vanity Kodaks, were made in a wide range of colours, which made these models extremely popular. In conception, they are similar to the Vest Pocket Kodaks

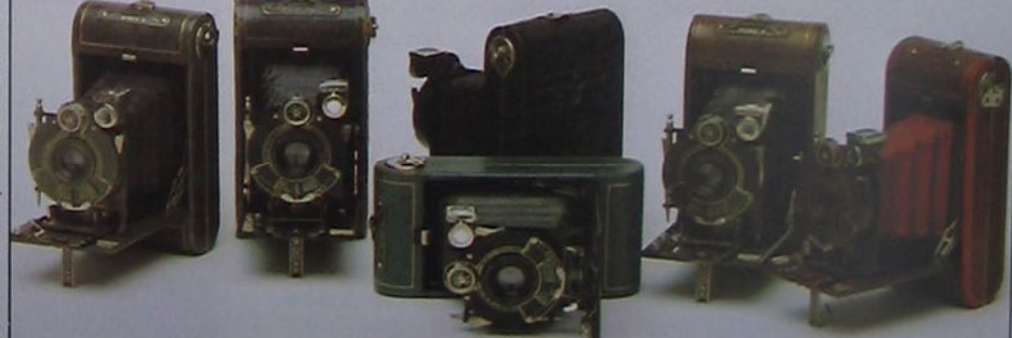


All photographs by Colin Gianfield

Rollfilm cameras are probably the most collectable of camera types. They were often in the forefront of innovation long before the advent of the 35 mm format, and at a time when the popularity of plate cameras was waning. Even during the 1950s, when 35 mm began to be established, rollfilm cameras retained sufficient adherents, both among users and manufacturers, to ensure a continuing flow of new, or at least revamped models. Since then, the emphasis has been mainly on refining existing designs to suit the exacting requirements of professional users: the Hasselblad 2000FC/M, for example, is a vastly improved descendant of the original Hasselblad 1600F of 1948.

The number of variations of rollfilm cameras is so large that there can be no definitive categorization. Historically,

Cameras courtesy of Malcolm Gianfield



and a few stereo models; even a gem like the Zeiss Ikon Box Tengor is not often sought by collectors.

Rollfilm folders

Effectively, the history of Rollfilm folders began with the 90 x 112.5 mm Kodak of 1890, and for the next 20 or 30 years the most usual rollfilm folders were all Kodaks—in a huge range of sizes and formats. Few of these cameras are particularly valuable, because such vast numbers were made. The more elegant models, with red leather bellows and lacquered brass fittings, are prized as antique items but they are rarely of much interest to camera collectors. Slightly more valuable are the ones that incorporate high quality proprietary lenses or shutters, but, again, even these are not much collected.

One interesting feature of many old Kodaks is the *autographic back*—a long, thin, hinged flap in the back of the camera. The flap opens, revealing the film backing paper, on to which the photographer (using a brass stylus) can write data, which is transferred on to the film itself. This is an early version of the modern data back. Usually, the stylus supplied with the camera has been lost. Reputedly, Kodak paid a million dollars for the invention in 1913, and it was used from 1914 to about 1931. But it was never as popular as Eastman Kodak had hoped. In any event, increasing film speeds made it impracticable subsequently.

As with many other old Kodaks, Autographic Kodaks are not worth much, but they are likely to appreciate in value eventually. The only Kodaks that are popular with collectors, at least from this period, are the less usual models such as the panoramic Kodaks (many of which take 120 film and can still be used) and the focal-plane-shuttered Speed Kodak.

Increasing affluence, aided by the expiry of various Kodak patents, was the spur to the development of rollfilm cameras in the 1920s and 1930s. Most of the rollfilm folders of the late 1920s were a little spartan, although often of excellent quality. Zeiss and other major German manufacturers began to transfer



The 1935 Vest Pocket Exakta. Scarcely larger than the classic Nikon F, this SLR gave eight $2\frac{1}{4} \times 1\frac{5}{8}$ inch exposures on a 127 roll. Curious and complicated twin lens reflexes, such as the Zeca-flex (below left) and Welta Perfekta, combined the features of the popular folders and boxy TLRs and took high quality lenses



Cameras courtesy of Vintage Cameras Ltd.

Wooden bodied This beautiful Lizars camera (from about 1905) hailed from Scotland. Using 120 film, it could be fitted with lenses varying from a Rapid Rectilinear to a Zeiss Tessar

their attention from plate cameras to the rising star of rollfilm.

In 1933, Zeiss brought out their Super Ikonta 530/2. It had a 105 mm f/4.5 Tessar in a Compur shutter (1 sec to 1/250), a coupled rangefinder (down to 1.5 m) and a 57×83 mm format, giving eight frames on a 120 roll. The only criticisms of this camera are that the shutter could too easily be released inadvertently, and that with less than reasonable care the front standard location could become a little floppy. A floppy front standard is something to avoid if you intend to buy any rollfilm folder for use rather than to





decorate a shelf.

For about the next 25 years, the Super Ikonta design was refined and when the last model was discontinued in the early 1960s, it became an instant collectors' item—as much for its usefulness as for the excellence of its workmanship. The eight-frame versions are still more sought after, but the 11-frame 57 × 57 mm models are also desirable. The 'baby' 57 × 41 mm models are more appreciated by collectors than by users.

There were many imitators of the Zeiss masterpiece, and there are no hard-and-fast rules for discerning the best ones. A good name on the lens is always a good guide: Zeiss, Schneider, Ross, and Voigtlander are four of the best. Another guide is a good shutter: Compur for preference, or Prontor. The general quality of finish is also a good guide, as is the rigidity of the front standard. Usually, it is easy to tell whether movement is fair wear and tear, misuse or simply bad design.

There are a few extremely expensive

Quality results can be obtained with these postwar folders. They are (from left to right) the Zeiss Ikonta, Kodak 66 and the larger Ensign Solfix 820

The postwar Super Ikonta (left) has an f/2.8 Tessar lens. 'Made in occupied Japan' is the legend on the back of the Mamiya 66 (right)

If the advantages of the large negative appeal to you, it is best to go for a late model with coated lens, full range of shutter speeds, flash synchronization, automatic film spacing and coupled film wind-shutter cock. For collectors, there are some cameras that should appreciate in value rapidly. These include early Japanese folders (such as Mamiya and Konica), if only because the first of anything is always worth having. Kodaks from the Nagel works in Stuttgart, which were usually of superb quality and are underpriced because they have the Kodak name on them; and anything unusual, such as the 1956 Agfa Automatic 66, which was about the second rollfilm camera to incorporate automatic exposure.

One other point to remember about rollfilm folders lies with the film they take. 120 rollfilm is still made but 620 (which differs only in the spool ends) is obsolescent and so is 127; 828 was never popular and is now almost defunct. Some 620 cameras will accept (or can be modified to accept) 120, but before you get too attached to a camera, ensure that you can obtain film for it.

Reflex cameras

The grandfather of the reflexes, which remains prestigious to this day, is the



The 1950 Hasselblad 1000F is an improved model of the original 1948 1600F. It can be used with current film magazines, Polaroid backs and interchangeable viewfinders

cameras in the rollfilm folder category. They include the Super Ikontas, the 1938 Voigtlander Prominent (complete with coupled rangefinder and built-in extinction-type exposure meter) and Kodak Six-20—the first camera with automatically controlled exposure via a photoelectric cell. Generally, the prices of these cameras reflect their worth as picture-taking instruments rather than as antiques.

Rolleiflex. The first Rolleis took the long-defunct 117 six-exposure film, but almost all have since been modified to accept 620. The original 1928 model is highly collectable, with knob wind, red-window frame counting, and separate shutter cocking. Later models, such as the 1932 (crank wind) and 1934 (coupled shutter cocking) types are also reasonably popular, but not outstandingly valuable. The same is true of the original (1933) metal plated Rolleicord, with its odd art deco pattern. Of the later models, the Rollei-Wide (with 55 mm lenses) and Tele-Rollei (with 135 mm lenses) command high prices as much



Camera courtesy of Paul-Henry van Hasbroeck

for their usefulness as their rarity, and the Rolleimagic automatic and Baby Rollei 127 models are beginning to appreciate in value.

Besides the Rolleis, there are few twin lens reflexes (TLRs) collected for their own sake. The Voigtlander Superb is the leading example. It bristles with such odd technical innovations as a shutter speed scale engraved backwards and read through a prism, and a curious parallax-compensation system.

The folding TLRs, such as the Welta Perfekta and Pilot, are collectable, as are those that use non-square formats. One reason for the adoption of the square format in TLRs is the difficulty of tipping a non-pentaprism reflex on its side. Examples of 57×83 mm TLRs include the Superfekta and the Ontoflex. All of these are pre-war, as are most of Zeiss's Ikonflexes, another moderately collectable TLR design.

For the future, the early Japanese models are worth watching, as are some of the weirder French models, and the British MPP Microflex and Microcord are claimed by many to be better than their Rollei contemporaries.

Rollfilm SLRs became established only when Victor Hasselblad popularized the type with his 1948 1600F (a most collectable camera). Whether they be the crude and simple Ihagee Paff (in the tradition of the plate reflex, such as the National Graflex), large and rigid-bodied like the Reflex-Korelle, or square and functional like the Primaflex (allegedly the forerunner of the Hasselblad), they are highly regarded by collectors. The only pre-war rollfilm SLR encountered commonly is the 127 Exakta, which formed the basis for the 35 mm Exaktas.

Since the 1950s, most rollfilm reflexes have been at least nominally usable, although some of the more obscure and

Reliable twin lens reflexes The 4×4 cm grey finished Baby Rolleiflex (left) and Yashica 44 of the 1950s and 1960s have not retained their popularity, despite their compact dimensions and first class lenses. Nevertheless, these cameras are well worth collecting both for their immediate usability and for their potential value in the future

short-lived Japanese models are better suited to a museum's shelves than a photographer's kit. They break distressingly easily, and are difficult or impossible to repair. Some, at least, deserve a place in the Chamber of Horrors, and a rollfilm SLR that is not working is worth virtually nothing.

A wide variety

In the residual category, there are a number of most usable and collectable cameras. The usable ones include the Simmon Omega (later Koni-Omega Rapid) with its coupled rangefinder, interchangeable lenses, and push-pull film advance. This camera is still in production, but earlier models are not usually expensive and are both useful and interesting. The Kodak Medalist is a good, solid-bodied rangefinder camera, like a giant 35 mm, but it takes only 620 film and, mechanically, is not totally reliable. Like the Omega, it is much sought after in its native USA.

Fujica's G690 is like a mammoth Leica, and its high price reflects its usefulness, whilst the Thornton Pickard Machine Gun Camera commands a premium because of its rarity, its superb construction and its extremely close resemblance both in appearance and in operation to a Lewis gun.

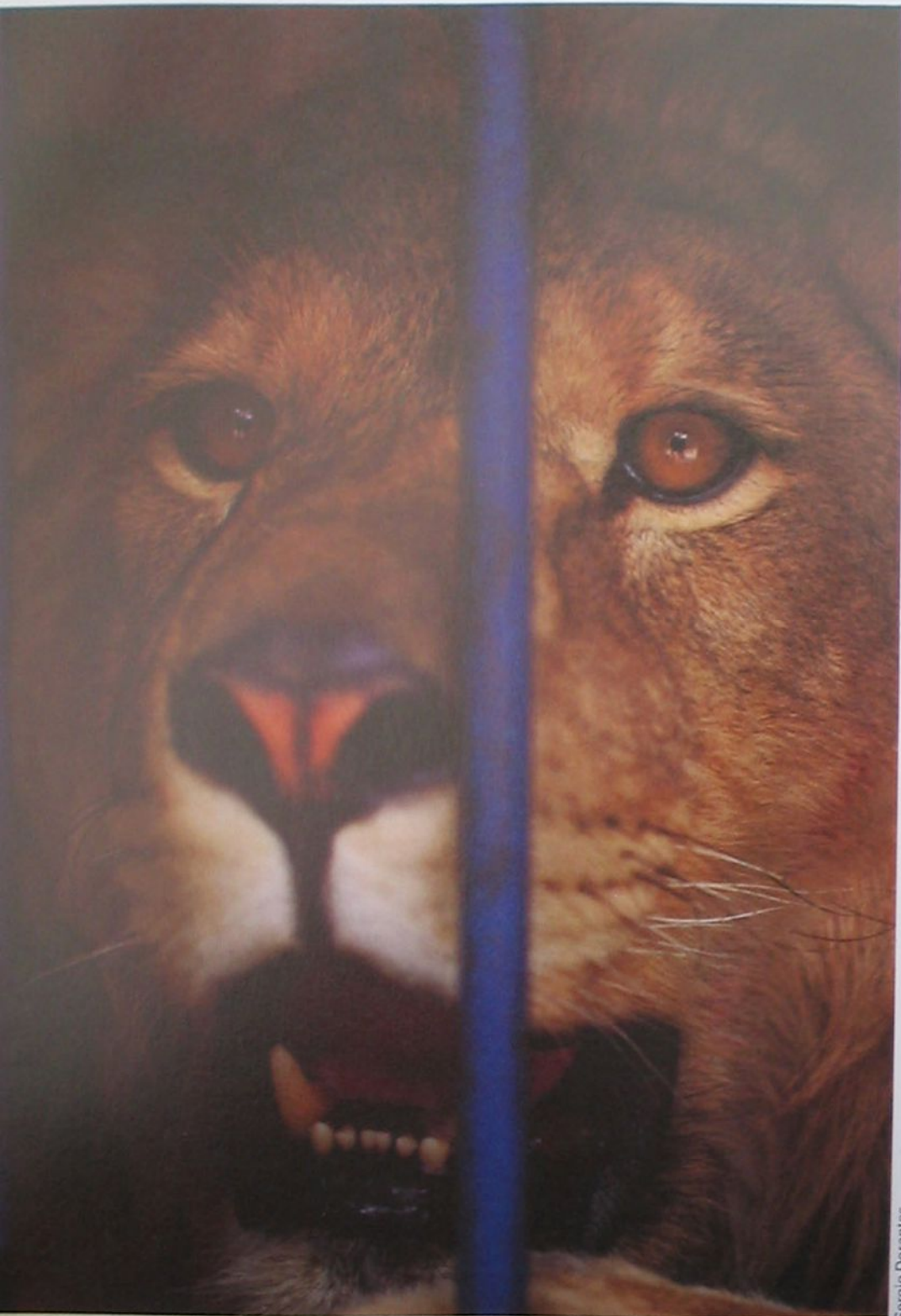
Although wood-and-brass attracts the antique collector, and 35 mm attracts the lover of high quality as well as the scholar tracing the development of the modern camera, rollfilm cameras are probably more attractive overall—combining performance, interest and utility. Although they command much more than they did a few years ago they are still relatively inexpensive. If you want to collect them for their own sake, it is as well to specialize early, before you are saddled with numerous old Kodaks. If, on the other hand, you decide to combine collecting with using, you will have the pleasure of operating some fine cameras—and of having them appreciate in value even as you use them.

The 1950s French Lumière, more a super box than a twin lens reflex, has an ingenious built-in extinction exposure meter and a speeded shutter



Californian ZOO

A zoo is the sort of photographic location which can easily lead to predictable and uninteresting photographs, but with a little more thought you can produce something unusual and imaginative



Whether or not you have a special interest in animals, a visit to a large zoo offers the chance to take excellent and unusual photographs. For this assignment, photographer Sergio Dorantes went to Southern California, where, as well as a varied range of animals, many of which can be observed without the obstruction of cages, San Diego Zoo boasts masses of tropical plants and coloured flowers. In many respects the zoo has been designed so that the animals' surroundings are unobtrusive and this gives the opportunity to take more natural looking photographs.

Sergio has no specialized knowledge of nature photography but he tackled this assignment by taking each problem as it arose and trying to find the best way to portray each individual animal. One specific thing which his photographs illustrate is that it is not always necessary to include the whole subject in order to capture the essential characteristics of an animal. For example, a close-up shot of an elephant which shows just a tusk, part of its trunk and the texture of its skin, can produce a more original and a more telling statement about the animal than a shot which tries to include everything. It

Sergio Dorantes





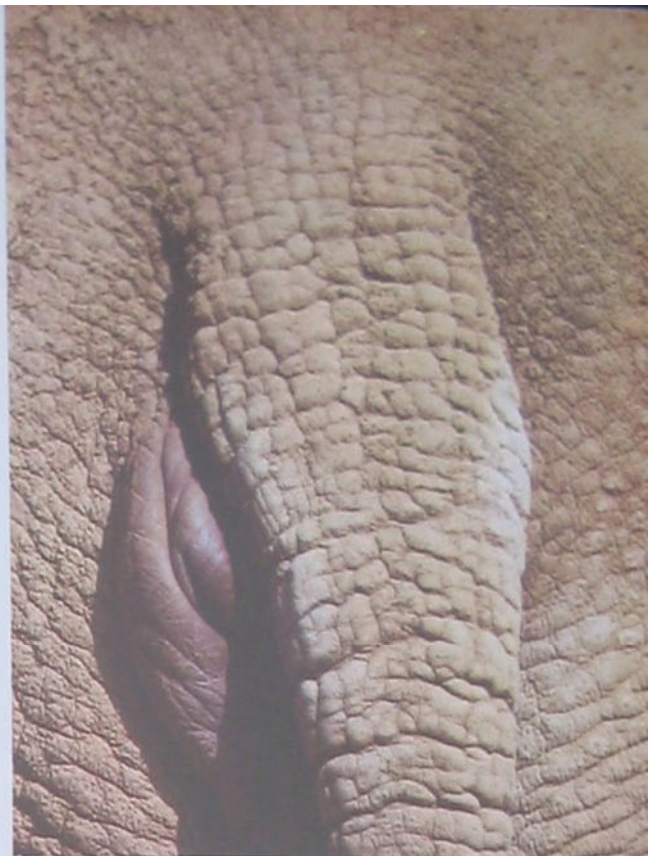
Lion When photographing animals in the shade with slow film Sergio waited until the subject was still so a slow shutter speed did not cause blur

Grizzly bear For this portrait of a bear Sergio was careful to make sure that both the eyes and the full length of the muzzle were held in focus

Elephant tail This shot is typical of the way Sergio concentrated on small details to show features

Zebra Backlighting and light reflected from a nearby white wall gave a pleasant soft glow to this shot. 300 mm lens supported on a monopod

Koala For shy creatures like this koala, Sergio had to wait a long time for the shot he wanted. Even then he still needed his 300 mm lens for a close view





Flamingo Using an 80-200 mm zoom, Sergio caught the graceful shape of this bird. Kodachrome 25 was used for all of these shots to make the most of the colours and to render the textures as clearly as possible

Camel's head The use of backlighting produced an attractive halo effect in the fur and whiskers. Sergio used an incident reading from a hand-held meter to make sure the exposure was correct. The shot was taken with his 300 mm lens at f/5.6, with an exposure of 1/16 sec

Polar bear This is another unusual view—it is obvious what the animal is, but by concentrating on a selective area, Sergio produced a more original and interesting shot. 80-200 zoom 1/125 second at f/8

Sergio Dorantes

also obliges the viewer to take a closer look—how many times do you remember just seeing the stripes of a zebra in detail or the padded feet of a polar bear?

San Diego Zoo is so large that it is difficult to photograph all the different animals in a single day. Ideally, you would be able to take the time to observe the behaviour of each animal so that you know what type of photograph would be most characteristic. Sergio decided before he even entered the zoo that he would just concentrate on a few animals rather than trying to cover everything. He recommends anyone visiting the zoo to buy an official publication giving details of the animals and their feeding times. This helps greatly when deciding what to do.

Sergio found that his telephoto lenses were most useful for this assignment. Most of the shots were taken with his 300 mm IF-ED Nikkor but he also used a 105 mm telephoto and his 80-200 Nikkor zoom. These lenses allowed him to



isolate the important features of the animals while leaving out distracting backgrounds or other unwanted areas. All shots were taken on Kodachrome 25 even though the slow speed of this film meant that Sergio had to carry a tripod and a monopod around with him.

'The zoo told me that I could use the tripod wherever there was plenty of room,' said Sergio. 'But in narrow passageways they said a tripod would cause an obstruction, and children might trip over it, so the monopod became essential.'

Sergio reckoned that the most difficult animal to photograph was the koala. This nocturnal animal prefers to sleep for most of the day, and Sergio returned again and again to find it still asleep. 'Eventually I decided to wait for it to wake up. It took almost an hour till the noise of the spectators disturbed it. Then I just had time for a couple of shots.'

What went wrong?

Children

Children are generally vivacious, unselfconscious subjects and can provide excellent material for candid shots. But good material does not guarantee good results, as Sally Greenhill points out

Despite the strong, almost full filling of the frame with the subject, the brightly lit yellow filing trays in the left hand background distract the eye from the subject—something that could have been avoided with only a slight change of viewpoint. Once it becomes second nature to take notice of backgrounds it is simple to prevent fundamental errors spoiling your shots. Here, I would have moved slightly to the left and asked the subjects to turn a little to face me—in one move this would have eliminated the trays and got a little more light on the faces—judging by the light on the girl's face and arm, there is a window somewhere over to the left. The giant bottle of water looks, at first sight, like a large, green fish, so if the girl had straightened her arms, the bottle and the two heads would have been more nearly on the same plane of focus, making the bottle more defined and recognizable



In common with the other two pictures, this shot, despite its candid, informal atmosphere, suffers from a confused background. The main subjects, the heads and the cake, have not been composed powerfully enough to compete with the clutter of the plates and mirrors on the wall behind, especially as the heads are almost the same size and shape as the plates. I think the best solution would have been for the photographer to move close up to the wall so that the open room formed the background. This would have given a dark, out of focus background to set the subjects against.

Also, the lampshade steals the limelight while the cake is very much in the shade—light from the lamp could have been used to cast highlights on to the cake and faces to restore their importance in the picture. A touch of flash, bounced off the wall would have improved the shot too, without destroying its pleasant atmosphere

Pictures of children playing, unless they are close-ups, are almost always more successful in an open situation or against a plain background. Possibly, the photographer could have organized the children so that one or other of the two walls in the picture formed the whole background. Either the white wall on the left, or the brick wall of the house on the right, would have been better than the mixture of the two, with the sharp dividing line falling just behind the main subject.

I would have taken the children to a park where less complicated backgrounds would not interfere with the subjects' activity. Make sure that you don't underexpose the pictures, though. It's all too easy, especially with automatic cameras, to end up with a white sky, dark grass and your subjects too dull.

In a more open situation it would be possible to experiment with the light coming from different angles by moving around the subject. Semi-backlighting, with the shadows running towards the camera, can often give the most dramatic lighting for this kind of subject, where the overall shape and the movement are more important than the clarity of each face







Creative approach

Grain and contrast

Photographic materials and techniques are usually aimed at producing sharp, evenly lit images, but sometimes you can evoke more atmosphere and create more impact by emphasizing grain and aiming for extremes of contrast



Alain Choisisnet/The Image Bank

The usual aim of a photographer is to produce pictures that are grain-free and which avoid extremes of contrast. Sometimes, however, obvious graininess and either very high or low contrast can actually be advantageous, and offer a new creative element to bring out the mood or style of a photograph.

Although it is possible to decide how to treat a photograph in the darkroom, or to go through your files for images that are suitable for a particular treatment, it is best to take pictures specifically with the effects you have in mind, on the most appropriate materials. Then not only are you technically prepared, you are also mentally geared up to seeing each scene as it will appear in the final picture, often radically changed.

The difference between black and white and colour is much more marked when you are trying for these effects. A low contrast, grainy image may look dreamlike and romantic in colour, but merely flat and boring in black and white. And a high contrast black and white image can appear striking, while in colour the strong hues may appear garish and disconcerting.

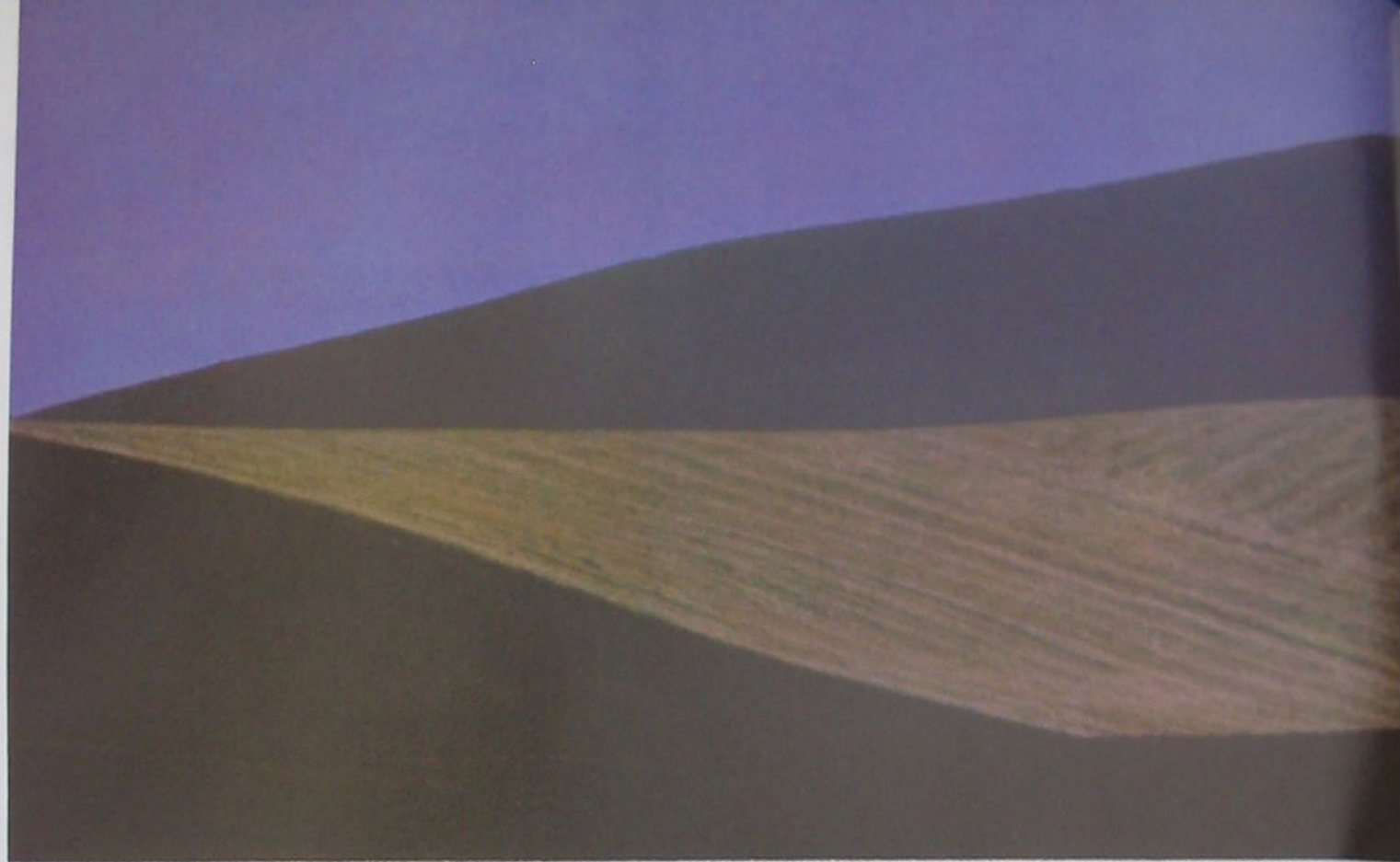
Some of the most appealing and easily produced results are those which are



Elizabeth Welsh/Tony Stone Picture Library

very grainy. In black and white this is easy enough to achieve by using a very fast film with almost any subject. However, when contrast is greatly increased, such as by using lith film (see page 914), you will have to select subjects more carefully. Similarly, if you were planning to make very large

Landscape Pin sharp resolution of detail is not always essential for landscape work—here fast film gave a grainy effect while the contrast of the light separated the foreground from the background. **Seed pods** An exaggerated grainy effect can also be created by using texture screens during the duplicating process



sectional enlargements to exploit a film's graininess, you should choose your film with great care—not too fine a grain, and not too contrasty, such as 2475 recording film, or uprate a normal fast film. Alternatively you could enlarge a small section of the film, though this demands a good quality enlarger lens and maybe very long exposures. Generally it is best to aim for the highest acutance and sharpness and the least clumped-together grain.

Grain alone can play a major role in the impact of a photograph. For example, in black and white, where the print is already an abstraction from reality, large and obvious grain accentuates this abstraction. The mood of the picture becomes stark and uncompromising, more graphic and heavy. It goes well with emotional, depressing or gloomy subjects—a weary work-lined face, a densely packed cemetery or an ugly industrial scene. Graininess adds to the coarse feel of these subjects, expressing the photographic equivalent of roughness. It can also emphasize drama since it rides roughshod over subtle mid tones. Smooth tonal variations are transformed into harder, sudden changes from light to dark, and details are obscured. Your attention becomes focused on shapes and masses, like the shape of a tree rather than its constituent leaves and branches; or the massiveness of a factory, rather than its windows.

While graininess is most commonly used for high contrast subjects, it can be used with low contrast scenes as well, such as misty views, particularly if you take great care to keep not only the image but the individual grains sharp.



Barry Lewis Network

Field patterns
Striking graphic effects can be produced by isolating a few contrasting patches of landscape—like these sections of fields.

Solitary house The grain of fast black and white film is ideal for conveying the bleakness in scenes like this. Hard paper brought out all the subtle contrast variations.

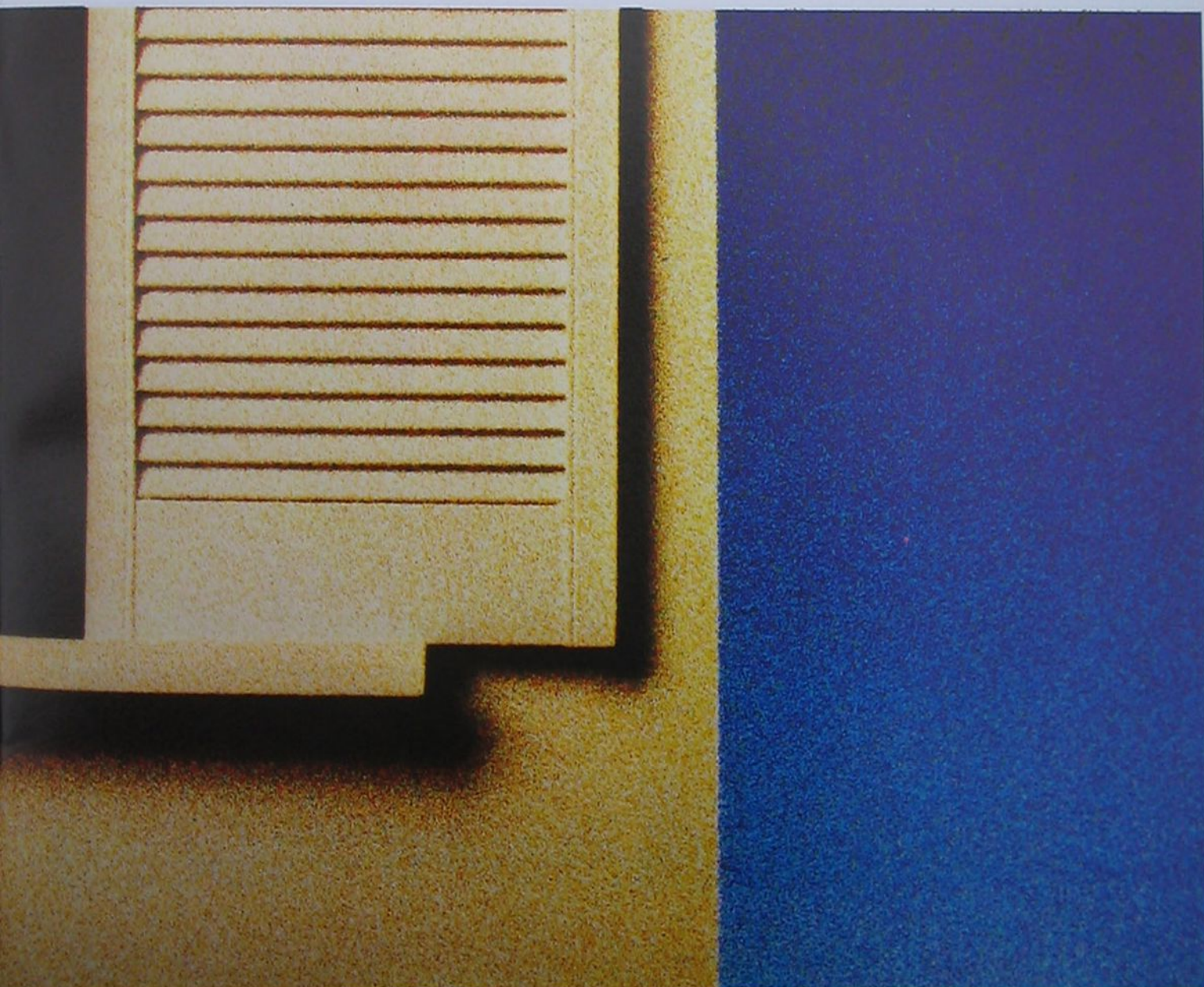
Dancer Deliberately opting for a minimum of contrast also suits certain subjects—especially when trying to establish a soft, romantic mood.

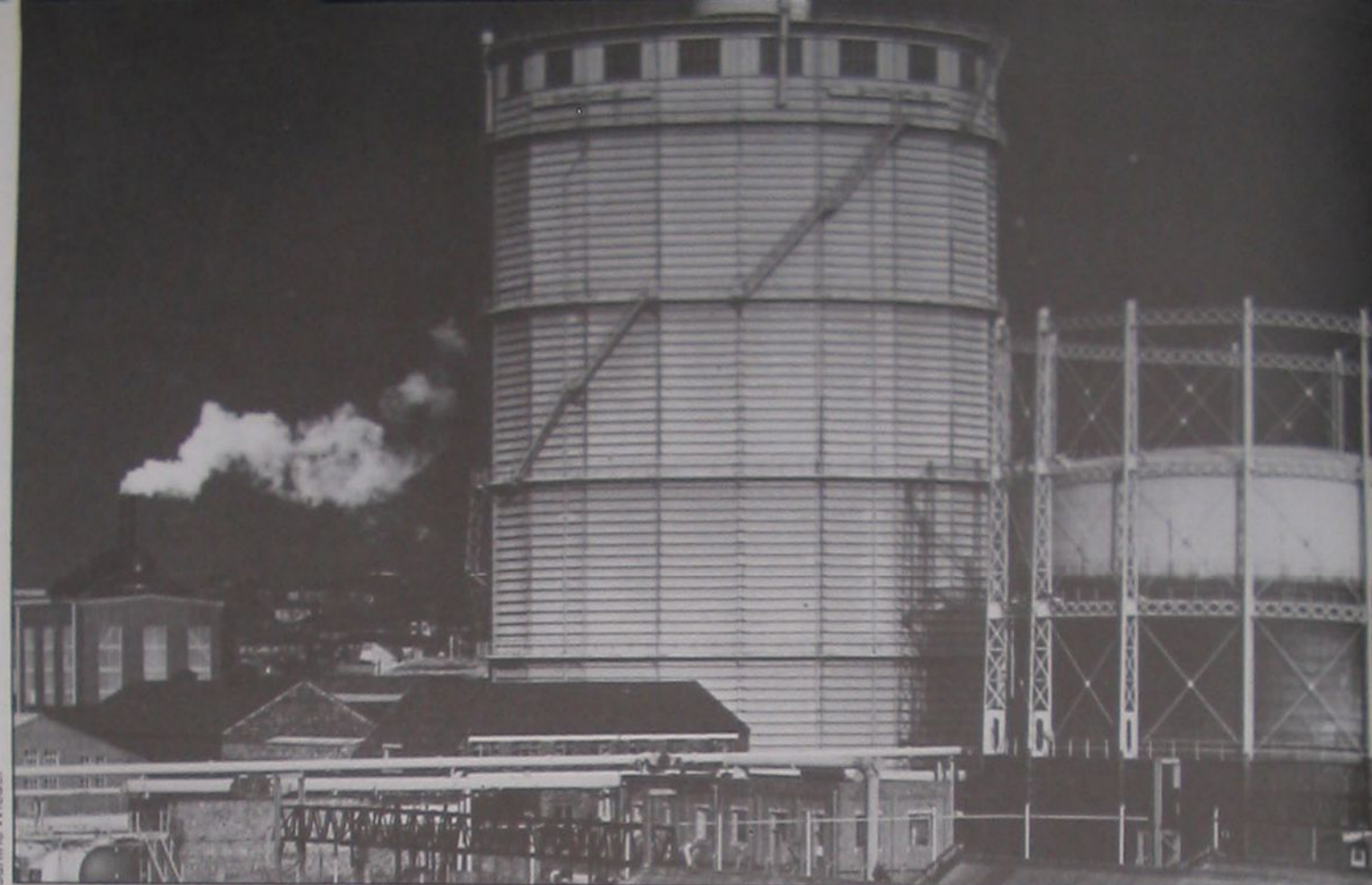
Window shutter Extreme grain can be achieved by enlarging a small portion of the original 35 mm slide on to 5 x 4 in. film

Then each particle is seen as a tiny black dot, and the image visibly breaks up into what seems to be individual particles. A view of a smog filled street would work very well in this way—it would seem as if you were looking at the smoke and dust motes themselves.

Such low contrast black and white images work best with subjects which have naturally low contrast, as with mist. The result is unreal and intangible, and the grain tends to reinforce this appearance, as you can see that the image consists of nothing but a mass of insubstantial dots. So if you want to exploit the method you should take original pictures which are high key, with very little range of brightness in them. One area of experimentation, for example, would be to make someone appear almost wraithlike, consisting solely of a collection of specks of matter. Do this by photographing the subject on grainy film against a light background on an overcast day. Make sure that there is very little difference in brightness in the scene—dress the subject in light coloured clothes with only a small difference in tone between them and the background. Then make a light, low contrast print, so that there are no tones in the background at all. Some dodging may be needed to get the right effect.

Nancy Brown/The Image Bank





You can also look around for subjects which will turn simply into a mass of tones when given the grainy treatment. The results may be completely abstract, in which case you must take care that the final picture retains some point. An example might be the interplay of shadows across a surface: the picture would be meaningless unless you included a recognizable shadow.

Once you turn to colour, the situation changes completely. Those subjects that become dramatic or striking with prominent grain in black and white, such as city streets, can appear merely carelessly or crudely photographed in colour. But grainy colour pictures have their own appeal, whether the colours are bright or subtle.

There are a number of methods of getting grainy results in colour. The simplest is to use grainy material to start with. One film, now discontinued, that was very popular for this purpose was GAF 500, a 500 ASA film—quite grainy by current colour film emulsion standards. But with modern film you can enlarge the images taken on fast films to emphasize the grain: some photographers deliberately use 110 format for exactly this reason, but even then some considerable enlargement is needed. Pictures taken in such a way have a quite different appearance from those which are on uprated film, as the dyed grains themselves become visible. The effect is very like the *pointilliste* technique of Impressionist painting, which sought to reproduce colours in an additive way by using dots of different colours. In the case of a photograph, the grains are cyan, magenta and yellow.

Industrial scene *Black and white film is well suited to recording tonal extremes—here the brooding ominous sky contrasts with the buildings*

You can enlarge transparencies directly on to film, if you wish, by using your camera without the lens under the enlarger or projector. The graininess of the copy film will have little effect on the graininess of the result, but your choice of copy film allows you to get either high contrast images, by copying on to a slow film such as Kodachrome, or low contrast ones, by using duplicating, or fast, film.

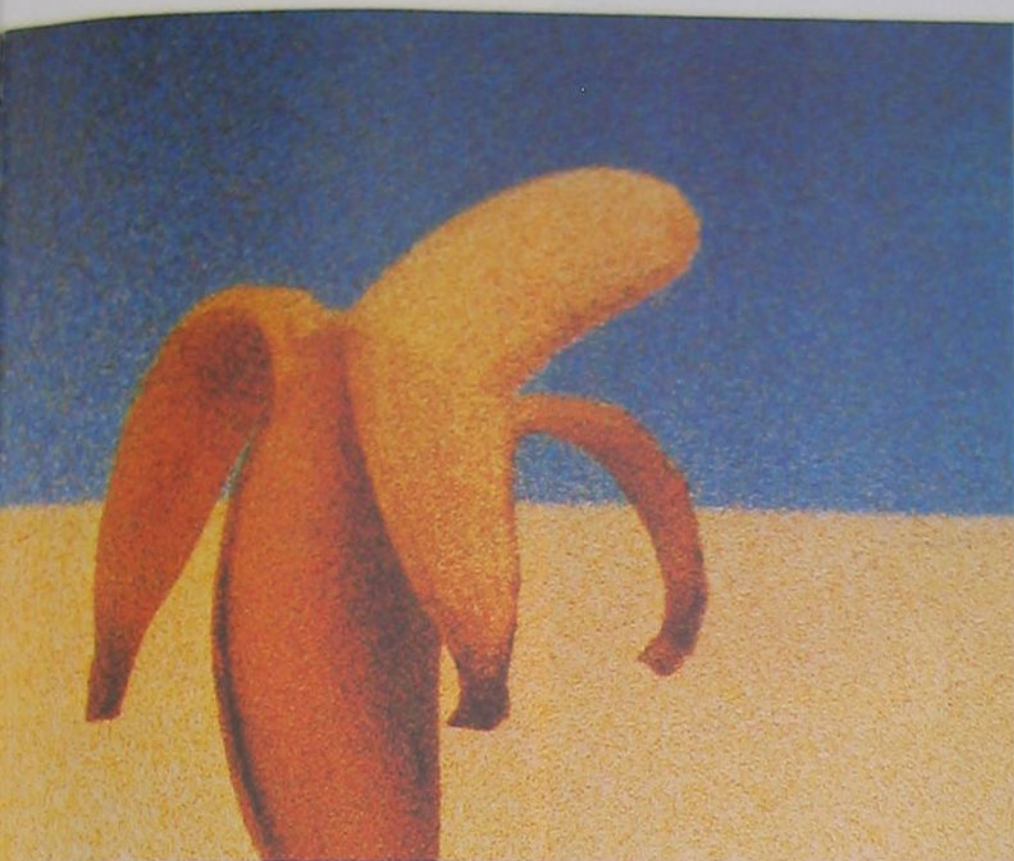
High contrast grainy images inevitably mean strong colour saturation, with vivid hues. Take pictures with this in mind remembering that you may be using only part of the image, and that this part should be very sharp. Strongly coloured objects, blue skies and bright sunshine are needed. You should also aim for very simple, graphic images. Some subjects which are not quite ideal for an ordinary shot might work well with the grainy treatment—small blemishes in the paintwork of an object could become submerged in the grain, or the colour of a slightly faded article could be exaggerated.

The bright, simple images produced by these techniques can be applied to a wide variety of subjects—flowers, bright paintwork—any brightly coloured scene has potential. What the effects all have in common is that the results are no longer representations of the subject—they have turned into images. The viewer cannot ignore the fact that they are images, made of dyes on film or paper, and are not made to look like faithful



copies of the original.

Grainy results are also popular for low contrast images. Some photographers, such as David Hamilton, specialize in these soft, romantic, dreamy pictures. But there is a considerable difference between these grainy images and soft focus, which is produced by other methods (see pages 93 to 97). Soft focus tends to give rather mushy results, while low contrast grainy images appear



almost painterly in quality. In these pictures, harsh lighting and bright colours are usually avoided, as the aim is to produce photographs which look as if they belong to a bygone era.

Flowers and landscapes are also suited to this approach, though again the lighting should be diffuse or mellow. Having experimented with graininess, it is also possible to alter the contrast of a subject in its own right, without aiming for grainy results. In the case of black and white, the traditional way of increasing contrast is to copy on to high contrast film, but you can also use slow, contrasty film in the camera. Microfilm (see page 1954) is suitable for this.

Moderately high contrast has a documentary quality, since news pictures are frequently copied and recopied, particularly archive material. You can lend an air of immediacy to some otherwise mundane scenes by this technique.

In colour, high contrast can be achieved by successively duplicating an image. It can produce vivid images from those which previously lacked strong colour, but the originals must be chosen with care. Those with areas of uniform colour, and with little overall brightness range, will work best. Flesh tones can take on an unattractive cast, appearing orange or brown.

David Fairman

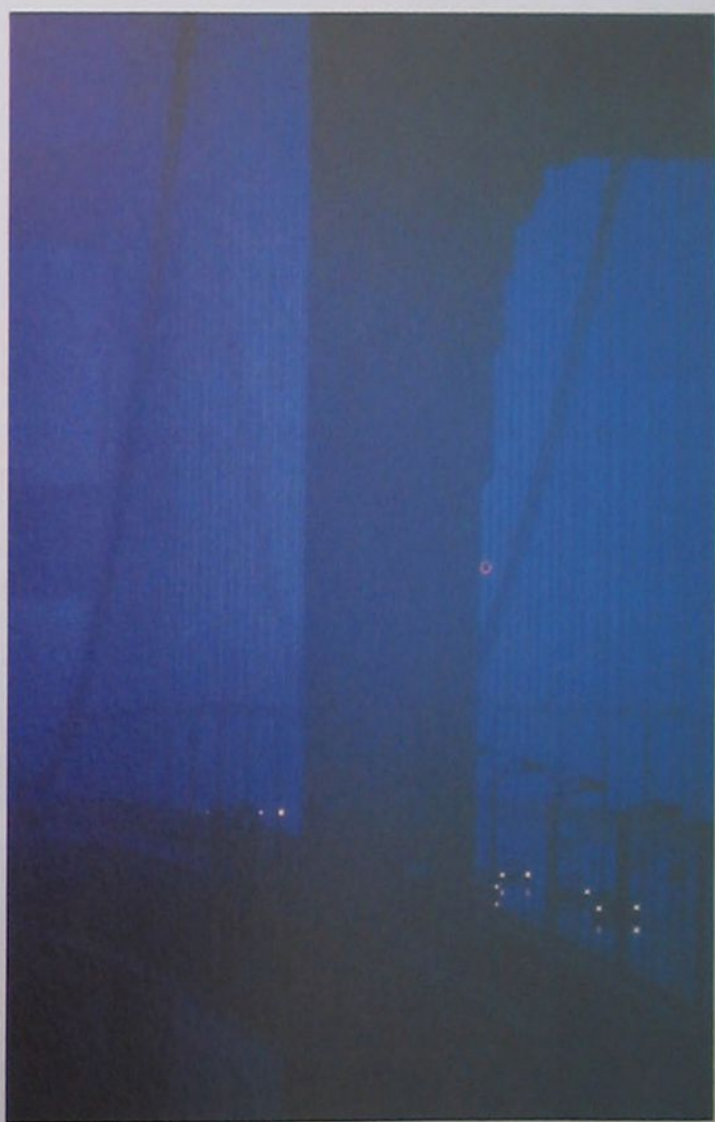


John Sims

Banana Even in the studio, deliberate exaggeration of grain can produce striking results, and is effective especially with bold shapes and strong colours

Cityscapes Here, dramatic contrast has been used to make the bright, sunlit office block stand out strongly from the dark, shadowed foreground

Bridge The grainy appearance of high speed colour transparency film has been exploited to underline the gloominess of this wet, foggy scene



John Clardge



Darkroom

Etch-bleach prints

Simpler than some forms of toning but as colourful as any, this process enables you to convert ordinary black and white film or print originals into spectacularly effective images

The *etch-bleach dye* process is a cheap and exciting way of making stunning coloured photographs from black and white originals. Although primarily used for colouring RC prints, the process was originally designed for films and plates and can also be used for these.

The chemicals and dyes required in addition to ordinary darkroom materials are cheap and readily available.

Etch-bleach is a reversal process in which exposed areas are removed from the supporting paper base or film base in a chemical bath. The bath reacts only with gelatin containing the silver of the exposed areas and only the gelatin in these areas is lifted from the base.

Unexposed parts of the print or film remain unaffected. The gelatin retained in the unexposed areas is then dyed to give a colour contrast with the clear area of the film or paper base—so giving a negative image of the original.

The original image

Because the process involves the complete removal of the gelatin emulsion layer in exposed areas, it is best to work on very high contrast line film or prints. Bold but simple designs and images work best. These can be obtained from continuous tone originals by making enlargements or contact copies on lith film (see pages 914 to 917)

Etching Line originals—such as this engraving copied on lith film to produce a negative print—respond particularly well to the etch-bleach-develop-dye process

and the copies can be used to make the line prints, on RC paper, or etch-bleached directly. For positive images, start with 'negative' originals.

The blacks of the original print or film image must be as dense as possible to ensure that enough metallic silver is present in the depth of the emulsion to act as a catalyst for gelatin removal. Otherwise the print may be patchy.

Without fogging the white areas, give up to double the 'normal' exposure and development. For example, if a test print shows correct exposure at ten seconds, give 20. Then develop the film for four minutes instead of two. If fogging occurs, slightly reduce exposure until a crisp black and white image is obtained.

It is best to try out the technique on prints rather than film until some experience of the process is gained. Any form of black and white paper can be used but RC is best. Although the technique was originally used in conjunction with fibre-based paper, the process temperature has to be very high, and there is a tendency for the dye colour to sink into the base. Bleaching is much more controlled with RC paper. Prints must be properly washed after fixing.

Etch-bleaching

There are several formulae for preparing the etch-bleach baths (see panel). Kodak EB (formula 1) works exceptionally well on films or plates but better results are obtained on RC prints by using one of the three alternative formulae. Try using the EB formula at a higher temperature than recommended for films, say 40°C–45°C. The etch-bleach solution can sometimes be bought by special order from photo shops but it is an easy matter to prepare your own. The chemicals used are readily available and could be weighed out precisely by your local pharmacist.

Shortly before the etch-bleach solution is required, mix equal parts of solutions A and B. For solution B, use hydrogen peroxide in '10 volume' or '20 volume' strength—it is sold in these strengths. Solution B should be stored in a brown corked bottle in a cool place away from bright light. The mixed etch-bleach solution has an active life of a few days. Wear gloves when preparing, mixing and using the etch-bleach solutions to avoid skin irritation.

Start the etch-bleach sequence by soaking the print—give it a full wash if you feel the original wash may have been skimmed at all. Then transfer the print to a dish of etch-bleach solution, at 20°–24°C, agitating continuously for three minutes, or until the image has completely dissolved. Stubborn parts of the emulsion can be removed by careful rubbing with a cottonwool swab or sponge. The remaining emulsion is very easily scratched in this wet state, so be

Etch-bleach processing



1 In addition to the utensils here, you will need etch-bleach chemicals, developer, suitable dyes and storage bottles for prepared solutions



2 Start by mixing up the etch-bleach solution. Ask your pharmacist to weigh up the amounts you need if you cannot do this yourself. (Formula 4 was used here)



3 Before use add an equal quantity of hydrogen peroxide to the etch-bleach solution. Immerse the washed print in this for several minutes



4 Depending on the strength of the solution and its temperature, several minutes may pass before emulsion removal occurs. Then wash the print



5 Transfer the print back to the dish of etch-bleach solution for complete removal of the emulsion. Carefully swab clear areas of fine detail which do not float free



6 Now wash the print thoroughly, ideally in running water, alternatively use several complete changes of water until the rinse water runs clean



7 You can now redevelop the image to introduce a type of Mackie line effect in areas not completely bleached, or to encourage bleaching in a repeat run



8 After washing the bleached print, (and after redevelopment), transfer it to the dye bath you are using. Make sure powder dyes are mixed properly



9 Then carefully rinse the dyed print to clear the highlights. As some dye is washed out, slightly over-dye the print when dyeing



been removed, wash the print under running water to remove traces of the etch-bleach solution. The print can then be dried or dyed.

At this stage, you can redevelop what remains of the image, using any developer. Followed by a repeated bleaching sequence, this helps remove stubborn emulsion. Alternatively, by continuing with the dye stage, you can restore light and dark greys in the picture.

Dyeing prints

Almost any type of dye can be used for colouring the emulsion, but the natural fibre version of the widely available Dylon brand range offers a large choice of colours. These dyes are in powder form and should be mixed up at double strength. Add a few drops of wetting agent to promote even coating. Two or more colours may be mixed to obtain further colours. Wear gloves to prevent almost indelible finger stains, and protect both yourself and all work surfaces from splashes.

Apply the dye using a large swab of cotton wool. Saturate the entire surface of the print to avoid a blotchy appearance. If you prefer, make up a dishful of dye and immerse the print in this until the colour is slightly darker than you want. Agitate the print continuously.

Transfer the dyed print to a wash bath of running water and leave it in this until the last of the surplus dye is removed and the wash water runs clear. Only the unbleached areas will accept dye and you may find, with some types of dye, that it is better to remove surplus dye with a cottonwool swab rather than risk washing. Simply lay the dyed print on a sheet of newsprint and gently wipe the surface of the print to clean the highlight parts of the image. Then dry the print.

Slight veiling of the highlights may be removed by carefully swabbing the affected areas with ordinary domestic bleach, followed by a two minute wash. But the cause of veiling is often inadequate print density of the original image—residue gelatin will of course absorb dye. If the problem persists, try using a harder grade of paper and more concentrated developer.

Colour paper base The unusual effect of using a positive original print made on coloured fibre-based paper, subsequently etch-bleached to give a negative image. Although chemicals work best on RC papers, fibre-based materials can be tried and can be successful

Etch-bleach-redevelop-dye process The process works best on line originals but can work with continuous tone images (such as lower left) which are redeveloped (centre left) and dyed (righthand pair)

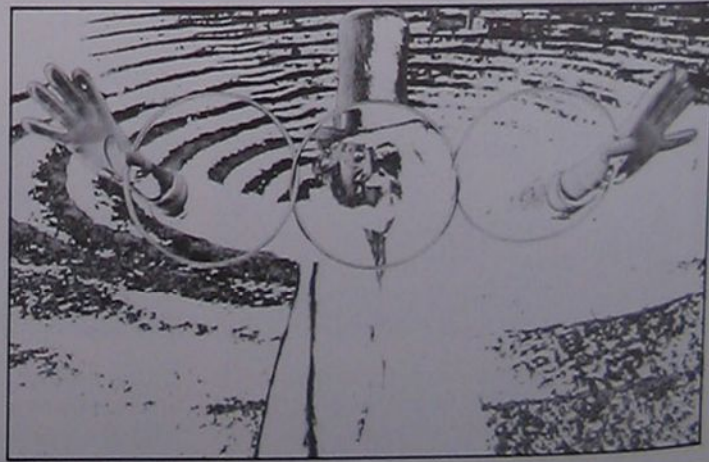
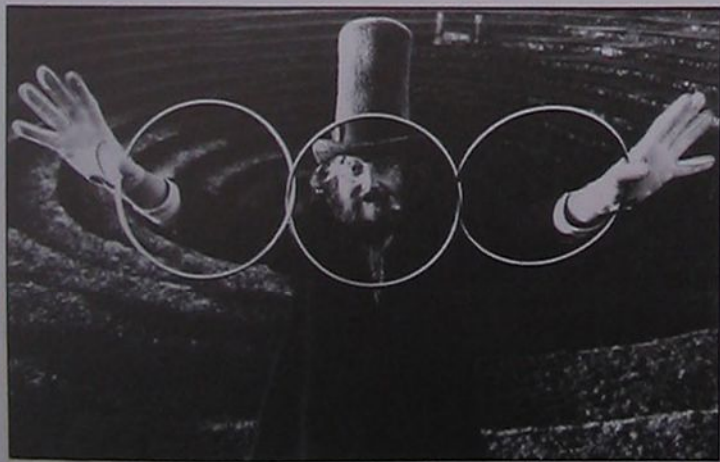
careful not to 'pick' at areas of fine detail which you wish to retain.

Etch-bleach solution is capable of dissolving any gelatin which contains metallic silver. If there is insufficient silver in the depth of the emulsion, the gelatin here will not dissolve—hence the importance of giving ample exposure.

If the image fails to bleach completely, the hydrogen peroxide may be too weak or exhausted. Make sure you use fresh solution.

When all the black image area has

Lawrence Lawry



Etch-bleach formulae

	Formula 1 (Kodak EB)	Formula 2	Formula 3	Formula 4
Solution A				
water (warm)	750 ml	750 ml	750 ml	750 ml
cupric chloride	10 g	14 g	120 g	—
copper sulphate	—	—	—	120 g
acetic acid glacial	—	30 ml	—	—
citric acid	10 g	—	140 g	150 g
potassium bromide	—	—	—	7.5 g
water to make	1000 ml	1000 ml	1000 ml	1000 ml

Solution B hydrogen peroxide (20 vols to 40 vols and 10 vols may be tried)

Mix equal parts solution A and B. Solution temperature above 20°C may speed up rate of emulsion removal—but heat solution indirectly using a waterbath. About 100 ml each of solutions A and B is sufficient for a number of prints

Selective treatment

By using art masking fluid, tape or film it is possible to bleach and to dye on a selective basis. This makes it possible to include parts of an original black image and as many dye colours as wanted.

Selective etch-bleaching is best done by dipping just parts of the print in to the solution, or by localized swabbing, but for extensive and intricate work it is more convenient to apply liquid masking to the dried print beforehand.

To selectively dye a print, apply masking after the etch-bleach stage either before or after the first dye has been applied, depending on how you are working. When laying down many different colours, always start with the darkest and progress to the lightest so the effects of spillage are rendered less noticeably. When the first dye has been applied, leave the print to dry before applying the mask. Then dye the print with the second colour and leave it to dry.

Alternatively, you may prefer to completely mask the etch-bleached image and gradually remove parts of the mask as each dye colour is applied. Use a swab well saturated with dye to do this, keeping it moving at all times to prevent blotchiness.

Film mask material is useful for blanking off large areas, and can be cut to precise shapes with careful use of a scalpel. Liquid masking fluid can be painted on and is more suitable for

intricate shapes and small details. This is easier to spread when mixed or shaken well. Use plastic applicators rather than brushes as they are easier to clean, and cover more evenly. Make sure all areas not to be dyed are covered well. As the dye will seep through the smallest hole in the mask, give two coats to seal it.

Etch-bleaching film

The etch-bleach dye process can be applied to any high contrast process film—lith film is ideal, since no intermediate tone elimination stage is necessary to get an image consisting of solid black on a clear background. If you want to treat parts of the image selectively, a large size copy makes work easier. This can later be copied, on normal slide film, to give an image suitable for projection. Etch-bleach dyed slides can be combined in sandwiches for special effects.

If you have an existing black and white lith negative, etch-bleach this in the normal way. For dyeing the remaining emulsion use dyes intended for photographic use, such as those supplied in the Photocolour kit. Mix a few drops of your chosen colour with enough water to cover the film. Use a saucer, Petri dish or shallow tray large enough for the film sheet or roll that you are dyeing. Immerse your film in this colour bath for two or three minutes, agitating continuously. Then wash the film to clear the



Multiple colours By using paint-on mask fluid, parts of the image can be protected from either bleaching (to leave black) or application of a particular dye, enabling two or more colours to be applied

highlights of dye, and leave it to dry.

The result is a coloured positive transparency—presuming you started with a negative image—which is block dyed in the chosen colour.

The etch-bleach process can be applied to unprocessed film as well. Develop this for at least the normal time, remembering that a dense image is essential. Then wash the film thoroughly. Transfer it to a deep enough bath of etch-bleach solution (use the Kodak formula), agitating continuously for four or five minutes. Briefly rinse the film and then transfer it to a white bowl containing water. Now fog the film to white light, using a photoflood bulb or similar lamp placed one metre or less above the bowl.

Redevelop the film so that the fogged, remaining areas of the film go black, and then complete fixing and washing as normal. You will now have completed a reversal process which is very handy for high contrast black and white slides.



B&W printing papers

Black and white printing papers have come a long way since the days of gaslight papers, and modern print emulsions are fast, easy to use and give a neutral monochrome image and a range of alternative contrasts

Of all parts of the black and white process, few seem simpler or more straightforward than the printing paper. It is, after all, essentially, just paper coated with a light sensitive emulsion. Yet there are a number of different types of emulsion, each with their own distinct characteristics, and many different ways of using each emulsion.

In the early days of photography, hardly any of the papers available had to be developed to give the image. These *print-out papers* had only to be exposed to strong daylight to produce the image. Nowadays, however, nearly all papers must be developed and are referred to as *development papers*. Print-out papers are now only used for making proofs and copying documents. This may sound like a step backwards, but development papers are in fact much more convenient to use because they can be exposed by controlled, artificial light.

Development papers come in many forms but they vary in three main qualities: emulsion type; contrast range; and paper type (thickness, surface and so on).



Print colours The upper print was made on printing-out paper, which gave the sepia image so often emulated today, while the lower was made in 1903 on Vicol paper, with a blue-black colour

Emulsion types

Nearly all print emulsions contain either silver bromide or silver chloride or a mixture of the two, though some also contain a small quantity of other silver halides, such as silver iodide. Silver chloride and silver bromide emulsions differ in two main qualities: sensitivity and the colour of the image.

Sensitivity Of the two principal halides, silver bromide is much the more sensitive. In terms of paper

speed, now often measured on the ANSI (American National Standards Institute) scale, bromide paper can be 100 times as fast as chloride papers.

In the early days of photography, when negatives were fairly large, most prints could be made by contact printing, and the low sensitivity of chloride was quite adequate. Indeed chloride papers—often known as *contact papers*—were ideal because they were only affected by very strong light and could therefore be handled in bright yellow safe lighting or even by gaslight. Exposures were made by burning a short magnesium ribbon about half a metre from the printing frame.

However, with the arrival of small format negatives, enlargement became necessary and the greater sensitivity of bromide was needed. Contact papers fell out of favour for amateur use and are now used for a few special purposes and for copying documents. Nevertheless chloride is still used in conjunction with bromide in chlorobromide paper. Slow chlorobromide contains a large proportion of silver chloride while fast

chlorobromide contains only a small proportion.

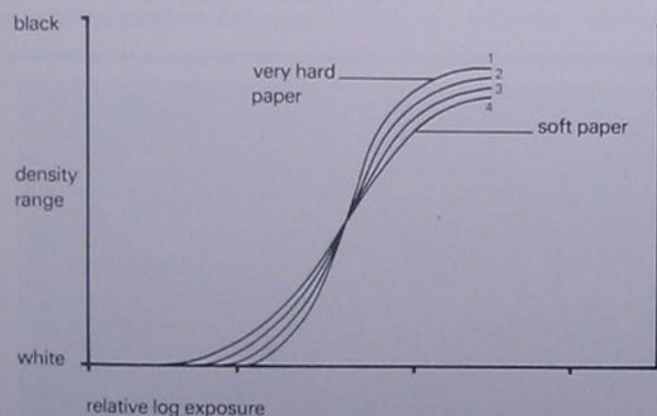
Nowadays, even 'bromide' papers contain some silver chloride. The difference between a true bromide paper and modern bromide papers can be seen clearly if you can find a very old packet of bromide. While modern paper is nearly white, the colour of silver chloride, old bromide papers are yellow.

Because they are exposed only to the black and white negative image, there is no need for print emulsions to be sensitive to every colour in the spectrum and dye sensitizers for paper have different functions to those for film. Dye sensitizers are included in virtually every modern print emulsion not to ensure even colour response but to make them faster by sensitizing them to a larger proportion of the enlarger light. This is particularly necessary with enlargement because enlarger lights are always slightly yellow—halides are sensitive mainly to light at the other end of the spectrum.

Chlorobromide papers, for instance, are normally only sensitive to violet and ultra-violet light. Dye sensitizers are added to make fast chlorobromide papers even faster by extending their sensitivity into the blue-green region of the spectrum. Bromide papers are similarly sensitized to make up for the loss of sensitivity due to the inclusion of silver chloride. Even some contact papers are now dye sensitized and can only be handled in orange light. Papers are not sensitized to red and yellow because of the need for a safelight—though lith papers are orthochromatic (see page 535) and can only be handled safely in red lighting.

Image colour Unless it is toned, the colour of a b & w print depends mainly upon the size of the grains if the base is white. Because long exposures can be given, the

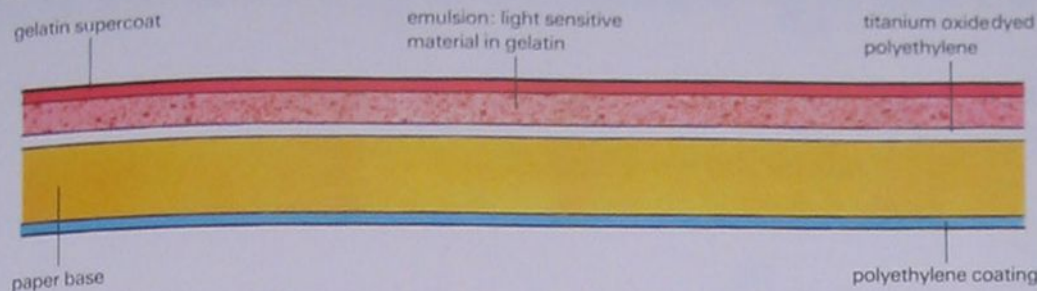
Contrast grades



Contrast grades The slope of the characteristic curve is different for each grade of paper. Soft (low contrast) paper needs a wide range of exposures to give its full tonal range and has a shallow curve; for hard paper, it is much steeper

The structure of b & w paper

Resin-coated (RC) paper



Fibre-based paper



Structure In fibre papers, the base is coated with barium sulphate to make it as white as possible. This layer is known, misleadingly, as the 'baryta' layer—baryta is the common name for barium hydroxide. In RC paper, the whiteness comes from a layer of titanium oxide under the polyethylene coat. Unfortunately on exposure to light this layer gives off a form of oxygen that slowly attacks the polyethylene which eventually cracks. On both papers, a gelatin supercoat prevents stress marks

grey density with only a small exposure but requires considerable exposure to give even a grey image and a great deal more to give its maximum black.

The difference can be seen most clearly on the characteristic curves for the papers. The curve for hard paper, with its minimum exposure range, has a very steep slope: the curve for soft paper, needing a wide range of exposures to give its full tonal range, is much shallower. But both curves start and finish at the same densities.

Because of the need to stock five or six paper grades to cope with every possible negative, Ilford introduced their *Multigrade* paper which includes emulsions giving several different contrast grades on the same sheet. Each emulsion grade is sensitized to a different coloured light and so is 'activated' by printing through an appropriately coloured filter (page 535).

grain size with any type of paper is very small and there is no such thing as a grainy print image—if a print looks grainy it is simply because the negative was grainy. Indeed, the grain can be so fine that grain size can be near to the wavelength of light and this produces a selective light scattering effect. Blue light in particular is lost. So if the image contains a high proportion of very fine grains, some of the blueness is lost and the image comes out not black but brown or even red.

Grain size depends partly upon the emulsion type and partly upon development. Bromide papers are relatively coarse grained and so give very good black images. Chloride, on the other hand, is fine grained and in pure form gives a very warm, brown image. However, manufacturers nearly always tended to add an organic *bluing agent* to chloride emulsions to yield a more acceptable neutral black image.

Chlorobromide papers give an image colour somewhere between bromide and chloride. However, the tone depends very much on the way the image is developed. In a high energy developer

the image is almost black. Developed slowly in a weak solution containing a high proportion of potassium bromide restrainer, however, slow chlorobromide paper can give a rich, warm brown or even red image. Unfortunately, slow development also means a loss of speed and contrast and slow chlorobromide papers have almost disappeared—particularly since you can achieve an equally warm tone without loss of contrast by speed or by silver toning.

Contrast range

Contrast differences for papers used to be achieved

by varying development—although much less variation can be achieved with papers than with films—but, once high contrast roll films were introduced, this technique proved to be inadequate. Now manufacturers produce most papers in several numbered contrast grades, ranging from extra soft (0) to ultra hard (5)—though only glossy paper is available in all six grades.

The different grades have a similar tonal range and give the same maximum blacks and whites: the difference occurs in the exposure levels needed to give these tones. A soft paper will give a slightly



Rocky coast One of the great attractions of slow chlorobromide emulsions was the warm brown image they gave if developed slowly

John Ward



Documenting The Depression

The work of the FSA photographers during America's grim Depression years set the standard for not only American documentary photography but for the world too

In the whole history of photography there has been no government-sponsored group of photographers who have produced such an important and influential body of work as the FSA photographers. Travelling through the United States in the late 1930s and early 40s, they documented the effects of the depression years on the small farmers of Middle America. And through these powerful and uncompromising images, they helped to shape American society and publicize the fate of its more unfortunate members.

The ranks of this group included such notable photographers as Dorothea Lange, Walker Evans and Arthur Rothstein—people whose work is among the cornerstones of documentary photography and whose influence extends to all areas of photography even now.

The FSA itself, more properly known as the Farm Security Administration, was an organisation set up as part of President Franklin Roosevelt's 'New Deal' in the 1930s. This was a campaign thought up by Roosevelt's government to try and counter the catastrophic economic depression that had hit the United States after the disastrous 1929 Wall Street Crash.

By the time Roosevelt came to power in 1933 the nation's economy was on the verge of collapse. Two-thirds of the banks had been forced to close, wages were down by an average of 60 per cent and one in three workers were unemployed.

The effect on tenant farmers and sharecroppers was particularly disastrous. Prices for their produce were so low that corn was left to rot in the fields—it was not even worth harvesting. At the same time, landlords and finance companies continued to press for rent money and the repayment of loans. Squeezed from both sides, many small-scale farmers were forced to give up their land and join the swelling ranks of migrant workers, shuffling from state to state, ready to do any job for a pittance. The government suddenly found that agriculture—its biggest and most vital industry—was in danger of disintegrating.

Obviously something had to be done. Moreover, it had to be seen to be done. In 1935 the Resettlement Administration (renamed the Farm Security Administration in 1937) was created to provide a safety net for small farmers by offering low-interest loans, help with land reclamation schemes and aid for migrant



All photographs from the Library of Congress

workers. Head of the Administration was Rexford Tugwell, a former professor at Columbia University. One of Tugwell's first acts was to appoint a fellow Columbian academic, Roy Stryker, as chief of the Historical Unit.

Some years previously, in 1925, Tugwell and Stryker had collaborated on a book called *American Economic Thoughts*—the first major economic textbook to use photographs extensively as part of its message. Many of the pictures Stryker commissioned for the book had been taken by Lewis Hine, and Hine's work had given Stryker an early insight into the persuasive power of documentary photography.

Stryker was originally employed simply to make a history of the activities

On the road Lange passed this young Oklahoma farming family trudging across the state in search of work with their entire possessions contained in two small trolleys. Many families like this were driven from their land when the effects of drought and over-mechanization turned the state into a dust bowl

of the FSA. Although not a photographer, he was very interested in the medium and saw its documentary potential. He had also seen Margaret Bourke-White's story on the Dust Bowl, a huge area of Mid West farmland desolated by soil erosion, which appeared in *Fortune* magazine in 1934. Stryker was equally impressed by the work of Dorothea Lange who was already well established

as a photographer—particularly for the work she and her husband, agricultural economist Paul Taylor, had done for the State of California on the plight of migrant workers there.

In Stryker's opinion, an intelligent and fearless use of good photography would be crucial to the FSA and he at once set about organizing a team of photographers who had the right social commitment and sensitivity, as well as the technical ability to do the job.



His first recruit was Arthur Rothstein, then a chemistry graduate and also from Columbia University. Although strictly speaking an amateur photographer, Rothstein had already helped Tugwell and Stryker on an earlier project—a pictorial history of American agriculture. In any case, Stryker was ready to give a chance to anyone who equalled his enthusiasm for photography. Even the rankest amateur was allowed to shoot a test assignment. If the results were good, Stryker hired them. His concern was always for the power of the photograph rather than the status of the photographer.

Not that the FSA lacked professionals. Stryker had been quick to draw into the organization Carl Mydans, a very

experienced photojournalist, and Walker Evans, already highly regarded as one of America's most promising photographers. In the following year, 1936, he also persuaded Dorothea Lange to work for the FSA. And the ranks of the FSA also included photographer John Vachon and the painter, Ben Shahn, for a period of time.

One disadvantage of hiring such talented and individualistic photographers was that it was difficult to keep them on the staff for long. First to go was Mydans who in September 1936 left to help in the launch of *Life* magazine. He was soon followed by Walker Evans.

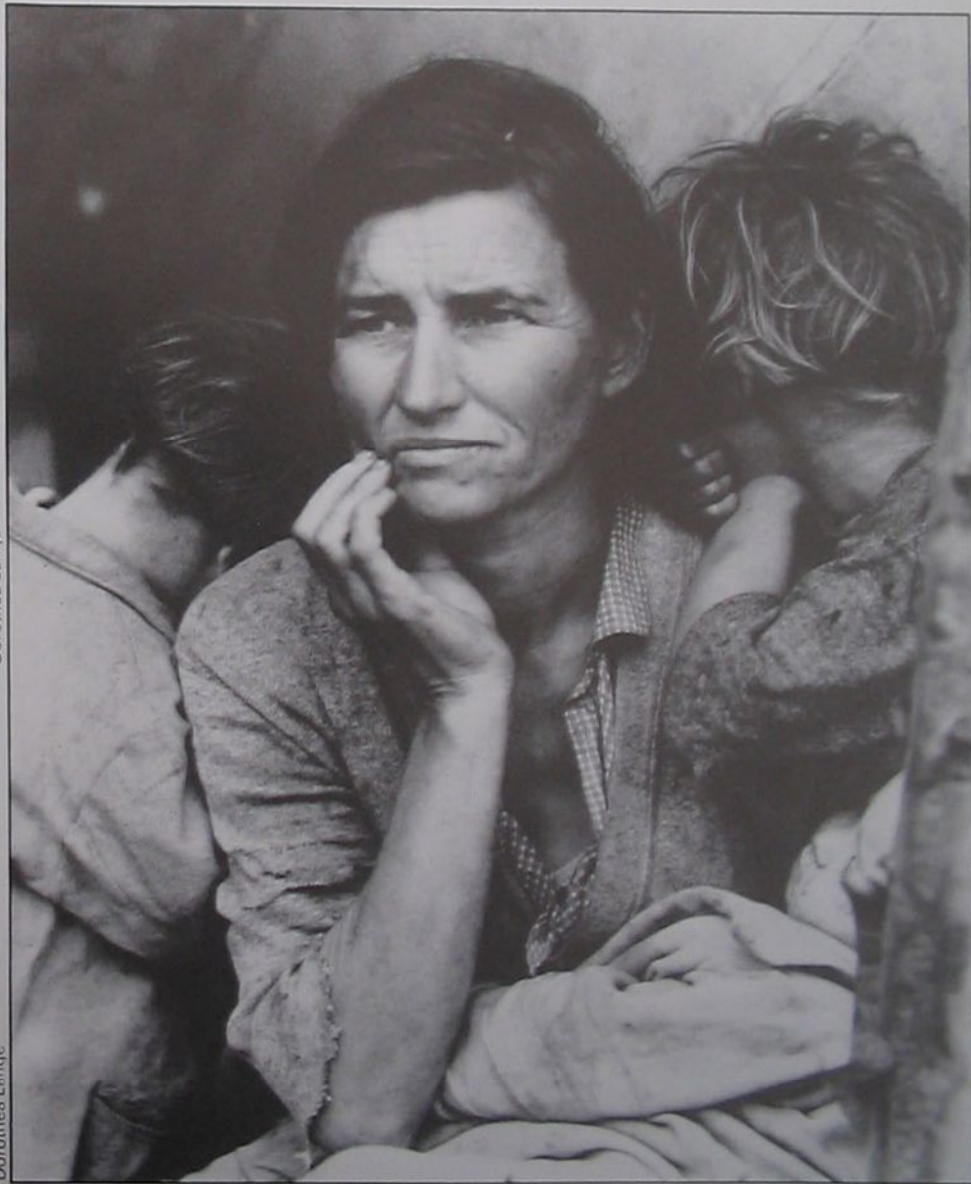
There had always been a certain amount of tension between Stryker and Evans. This was partly due to the tremendous differences in temperament between the two men. Stryker was extrovert and forceful whereas Evans was introvert and withdrawn, and where Stryker was a born publicist, Evans was almost uncomfortably taciturn. This in itself was not as much of a problem as their fundamentally different attitudes to photography.

Stryker believed that photography, at least as far as the FSA was concerned,

was something of a crusade. When Roosevelt appealed for support for his New Deal because 'a third of the nation is ill-housed, ill-fed and ill-clothed' it was the task of the Historical Unit to provide the evidence to back up this appeal. But Evans, while he was undoubtedly socially committed to the ideals of the FSA, felt that his job as a documentary photographer was to simply describe the world as objectively as possible. He was not concerned whether the images that he produced proved or disproved a certain political point.

This divergence of opinion was made worse by the fact that Evans was also deeply concerned with the artistic quality of his photographs, something which was of secondary importance to Stryker. Consequently he worked very slowly. He was the only FSA photo-

Migrant Mother, 1936 Dorothea Lange's famous study of a young mother and her children is perhaps the most famous of all the FSA images. The family were camped out at a frozen-in pea-pickers' camp in Nipomo Valley, California and had been reduced to living on wild birds and the frozen vegetables from the fields



Dorothea Lange

Dorothea Lange



Arthur Rothstein



grapher to use a 10 × 8 inch view camera and, in desperation, Stryker urged him to use a Leica. He hoped to get Evans to work faster and turn in more assignments and this was effective on some projects.

However, the rift remained and in 1937 Evans left, ultimately to work for *Fortune* magazine. Although he was only with the FSA for 18 months, Evans' influence on its photography was considerable. Whatever recognizable photographic style the Historical Unit had was basically Evans' style—an austere clarity and technical precision that is still the hallmark of great documentary photography throughout the world.

Fortunately, not all Stryker's photographers had such a fraught working

Pie Town, New Mexico, c.1940 Attracted to this town because of its name, Russell Lee soon found its community was also a good subject for his photography. He used his camera to record the relationships of a close-knit group of people working together to pull themselves out of the effects of the Depression

Russell Lee

relationship with him. Arthur Rothstein, who in later years was to become Director of Photography for *Look* magazine and the Sunday newspaper *Parade*, readily acknowledges that he owes his formation as a photojournalist to Stryker's guidance. Another famous contemporary photographer who owes a lot to Stryker's initial guidance is the black photographer and film-maker Gordon Parks. He joined the FSA in 1941 remaining until its dissolution and he was to work for Stryker again in 1944 as a leading member of Standard Oil's documentary team.

Although he was the first to admit that he was quite hopeless at using a camera himself, Stryker understood photo-

Dust Storm, 1936 A farmer and his two small sons struggle against a dust storm in one of the worst affected drought areas in America—Cimarron County in the Oklahoma Panhandle

Bud Fields and his family One of a series of photographs of several sharecropper families which Evans took to illustrate James Agee's memorable book *'Let Us Now Praise Famous Men'*

graphs perfectly, particularly how photographs can communicate ideas and information effectively. The pictures on the FSA files were intended for use both by the government agencies and by the press. Stryker knew exactly the sort of photograph that would appeal to picture editors while at the same time telling the story that he wanted told.

Arthur Rothstein's first assignment was in the Blue Ridge Mountains of Virginia where the inhabitants were being moved out to allow for the development of the Shenandoah National Park. The purpose of the assignment was to document the way of life of these hardy and self-reliant villagers before it disappeared forever. As it was his first assignment, Rothstein discussed the project in great detail with Stryker who helped him to realize the importance of thorough research into a subject. He also emphasized the tremendous value of photographing details and close-ups of seemingly trivial aspects of daily existence—details which nevertheless add up to a more evocative and intriguing document of people and the lives they lead.

While on this assignment Rothstein

instinctively used a technique that has since become familiar to documentary photographers. For the first few days, he simply walked around the area with his Leica around his neck. He took no pictures but spent his time talking to people. Only later, when he had gained their confidence, did he begin photographing.

The new small rangefinder cameras were ideal for this kind of work, but many of the FSA photographers also used far heavier and more cumbersome cameras without any loss of spontaneity or empathy with their subjects. The best known and perhaps the most moving photograph from the FSA file was taken with a 5 x 4 inch Graflex press camera, hardly the most surreptitious piece of equipment. This photograph was 'Migrant Mother' by Dorothea Lange. It has been printed in over 10,000 separate publications, making it one of the most widely reproduced images in the history of photography.

It is also a photograph that Dorothea Lange almost missed taking. Driving home one day she passed by a sign reading 'Pea-Pickers Camp' which pointed towards a muddy field dotted with



Walker Evans

wretched-looking tents and lean-tos. Exhausted after a month of working on location, she tried to ignore it and pressed on down the road. But her documentarist's conscience kept nagging her to turn back. When she did turn back and drove into the camp, the very first family she came across was that of the migrant mother in the photograph. Lange took only five photographs, gradually moving closer as she did so. Within a few minutes the session was over. She quietly packed her camera and left, taking with her one of the landmarks of documentary photography, and an image to stir the conscience of middle-class America.

If the 'Migrant Mother' was the FSA's most famous photograph, the 'Skull', taken by Arthur Rothstein in 1936, was perhaps its most notorious, because it became the focus of a major row between the FSA and its critics. These critics included the big landowners and loan companies who believed they stood to lose profits if the Administration succeeded in making the sharecroppers and tenant farmers self-sufficient. Some of them even regarded the FSA as a

Communist organization.

The photograph—showing the skull of an ox lying on parched and cracked earth—was first used by Associated Press, but it was miscaptioned by an editor who assumed it was a drought area. It actually showed a naturally dry gully. Someone ill-disposed to the FSA spotted the error and immediately claimed that the picture had been faked, that it was a piece of government propaganda. Stryker had always dreaded such a charge. He knew that if the American public ever thought that it was being manipulated, the work of the Historical Unit, and even the FSA itself, could be discredited. Fortunately, he was able to fight off this attack and prove that there was no deception involved, but for a while the entire photographic project seemed to be in jeopardy.

Over the years the FSA files have acquired such a reputation for the power of their black and white images that it is often forgotten that the FSA photographers were among the first to experiment with colour film. Unfortunately only about 700 of these Kodachromes still survive.



Arthur Rothstein



Farmers, Missouri, 1936 Carl Mydans' evocative portrait of poor farmers in Prairie City catches the mood of despair that swept rural communities in the late 1930s

The Skull, 1936 Rothstein's notorious picture. It aroused a storm of political controversy when it was used as a widely published symbol of the drought in 1937

35 mm Kodachrome was first introduced in 1936, followed by a sheet film version in 1938. For some time its use in publications was restricted to advertising, fashion and generally more glamorous subjects. This was partly because of the high cost of reproduction and partly because of convention. It was difficult to place colour photographs with the type of magazines that would be interested in stories of rural poverty—most of them just could not print colour. However, both Stryker and his photographers were anxious to use the new films whenever it was appropriate. From the start they were well aware of the dangers of looking purely for 'colourful' subjects. Colour was to be used solely for its documentary value, where it would describe the realities of life more clearly than monochrome.

Some of the best FSA colour photography was taken by Russell Lee in 1940, while he was working on an assignment

in Pie Town. Formed during the Depression, this was a unique community based on a combination of communal support and self-help—a sort of 20th century version of the frontier spirit that had forged the United States into a nation during the previous century.

Lee had joined the FSA in 1936 as a replacement for Carl Mydans and was to stay with the Administration until it ceased to function in 1943, making him its longest serving photographer. Although not as well known as Evans or Lange, Lee was in many ways the ideal photographer for the FSA. He was technically an excellent cameraman, deeply committed to the idea of social justice implicit in the New Deal and had a sympathetic nature that enabled him to quickly gain the trust and cooperation of the people he wished to photograph. He also had a precise understanding of what made the sort of strong, clear pictures that magazine editors wanted to use for best dramatic effect.

Not surprisingly, he and Stryker got on extremely well. Although Lee was out in the field for months at a time, Stryker frequently wrote him long and detailed letters about the type of pictures he was looking for at any particular moment. One shooting list alone contained nearly 100 separate subjects for Lee to photograph from 'Warehouses filled with food'

to 'Old tyre piles'. The list also illustrates a change in emphasis in the FSA's style of photography.

During the 40s this gradually shifted away from the early campaigns against poverty and exploitation. As some aspects of the New Deal took effect and the worst days of the Depression faded, both the government and the press started to look for more positive facets of American rural life—signs of prosperity, enthusiasm and optimism. Then, when the United States entered World War 2 in December 1941, it became more than merely desirable to show the success of American agriculture, it was regarded as a patriotic duty. Finally in 1943, with government departments being centralized as part of the war effort, the FSA was absorbed into the War Information Office and its photographers became increasingly involved in what was basically propaganda work.

Although in the turmoil of the war much of the FSA's work was forgotten, its achievements were extraordinary. In less than a decade, it had covered every feature of rural America—despair and want, joy and pride. Not only did these images make up a uniquely comprehensive historical record, many were also magnificent pieces of photography—classics in a documentary tradition that started with Jacob Riis and Lewis Hine and continues in the work of contemporary photographers like Robert Frank, Luc Chessex and Susan Meiselas. They also provided the inspiration for two major exhibitions staged by Edward Steichen at the Museum of Modern Art in New York—*The Family of Man* in 1955 and *The Bitter Years* in 1962.

The photography of the FSA had an extraordinary influence on American society in the late 30s. At no other time has photography made a nation so aware of its problems or been so persuasive in calling for reform. The FSA was also a great and lasting influence on photography itself. Several of its photographers went on to work for picture magazines—Dorothea Lange freelanced for *Life*, Arthur Rothstein joined *Look* and Walter Evans took up an enviable post with *Fortune* where he could choose, shoot and write his own assignments virtually unhindered. Each of these photographers brought to the magazines both the documentary precision and the concern for human values that characterized their work for the FSA and, from the broader base of the national press, were able to influence a new generation of photojournalists with these skills and attitudes.

Further proof of the quality of the FSA photographers' work can also be found in the continuing demand for their pictures. Even today, long after their initial documentary relevance has gone, the Library of Congress still receives a constant flow of requests from magazines and book publishers to reproduce prints from the massive FSA file which contains over a quarter of a million negatives from this unique collection.

Wide view equipment

Compared with what the eye sees, most cameras fitted with a standard lens offer a very limited view of a scene. But there is a wide range of wide view equipment for seeing much more of the picture

Throughout the history of photography, the narrow angles of view of conventional cameras have frustrated camera users. We see the world through eyes that take in a wide panorama of the scene in front of us, yet cameras give what amounts to a small window on the world. A number of designs for giving wider views have been developed. The simplest is the wide angle converter, but there are also specialized lenses and cameras purpose-built for the job.

Converters

For the amateur photographer, one cheap and practical solution to the problem of getting very wide views is to

use a wide angle converter—a device that fits on to the front of the prime camera lens to increase the view angle. The device is screwed into the filter thread, using a series VII adapter supplied with all converters. If you buy a converter, ensure that you get an adapter that fits the thread of your filter ring. You may need more than one adapter if you plan to use the converter with several lenses.

Converters are available in two basic types: wide angle and fisheye. Wide angle converters simply increase the angle of view of the prime lens, usually by about 30 per cent. They work best with lenses of 40 to 60 mm focal length.

Converters are attached to the front of a prime camera lens via a series VII adapter, which screws into the filter ring. They perform best on lenses of focal lengths in the range 40 to 60 mm

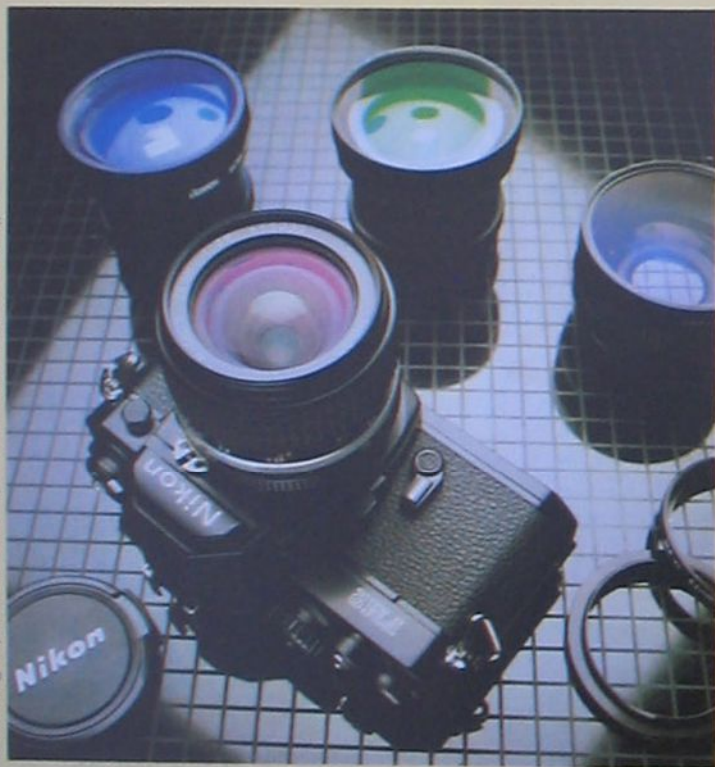
Super-wide angles of view are achieved with fisheye lenses. But for general photography, the image produced by a full-frame fisheye (below left) is more practical than that of a circular image fisheye, which is more suitable for specialist or 'one-off' shots

Used with a 50 mm lens, for example, the combination produces an equivalent focal length of about 38 mm. These converters can be used with lenses of shorter focal length, but definition is poor, and vignetting occurs, particularly on lenses of 28 mm or shorter.

Fisheye converters give a more pronounced wide angle effect, and cause straight-line portions of the subject to be recorded curved on the film. They are similarly attached via an adapter ring to the lens. Fitted to a 50 mm lens, they fill the entire picture area—with no vignetting. With a 35 mm lens, some vignetting occurs, and with 28 mm, the image is circular. Used with a lens of even shorter focal length, the effect is simply a smaller circular image on film, and not a wider angle of view.

The main advantage of using converters (as opposed to panoramic cameras) is their low cost. Both types are inexpensive, but there are other points in their favour. They can be used with fixed lens cameras to increase the versatility of otherwise limited models. They can be used with a wide range of lenses, because adapter rings are interchangeable. And because converters reduce the focal length of the lens with which they are used, they can act as close-up supplementary lenses, producing a much closer minimum focusing distance than would be possible with the unaided lens.

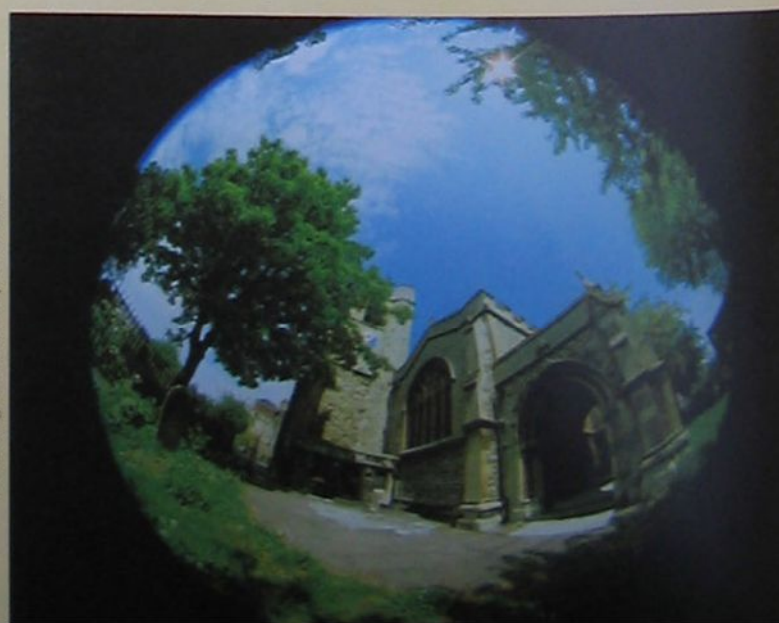
Against these advantages must be weighed the fact that generally, pictures taken by converters are much poorer in quality than those of a conventional wide angle or fisheye lens. In some instances, performance at full aperture is barely acceptable, and to get good results, it is usually necessary to stop the prime lens down to f/11 or smaller. For fisheye pictures, however, which are primarily



Dave King equipment courtesy of Nikon & Transworld Trading Ltd



Dave King lens courtesy of Minolta



novelties, poor definition might not be an important factor.

Some fisheye converters utilize the wide angle reflections of a highly reflective sphere. These are usually described as *bird-eye attachments*, and are of only limited use, even for casual photography. They record an image of the photographer and camera at the centre of each frame. For a few scientific applications, this imaging is desirable but generally, such devices can be regarded as little more than toys.

Wide angle lenses

The most common means of achieving a wide view is to fit a wide angle lens.



Ultrawide lenses—those with a focal length of 21 mm or shorter—are difficult to manufacture, particularly for SLR cameras. A major factor is that the retrofocus lens design that provides sufficient clearance for the camera's swinging reflex mirror requires great precision. As a result, these lenses are usually expensive, though it is possible to buy a 20 mm lens for about 25 per cent more than a comparable 24 mm.

Generally, ultrawides are much like ordinary wide angle lenses, except for the wider angle, but the shorter focal length lenses tend to be much heavier, bulkier and have enlarged front elements. Typically, maximum apertures in the 17 to 20 mm range are about $f/4$, but wider lenses are usually limited to $f/5.6$.

Perhaps the most distinguishing external feature of an ultrawide lens is the hood. This has a deeply scalloped appearance, because regions of the hood are cut away where the angle of view is widest so that they do not appear in the corners of the frame. When buying an ultrawide, check that a hood is supplied, or that a matched one is available as an extra, because at short focal lengths, a hood is essential for keeping stray light out of the lens.

Filters, too, are purpose-built. Usually, they are built-in, mounted in a rotating turret. This is not a luxury but rather an essential for good performance which would be impaired by unsuitable filters. In any event, the steeply convex front element, which is a prominent feature of many of these lenses, makes the fitting of

Large and fast
A 6 mm $f/2.8$ Nikkor fisheye lens towers monstrously above a compact 28 mm

A fisheye view
An astonishing 220° angle of view taken in by the 6 mm $f/2.8$ Nikkor fisheye. Standing well behind the camera, the photographer can even see his own outstretched hands



Dave Kinn lens courtesy of Nikon



a conventional filter impossible. Although filter turrets offer only a limited range of colours, lens manufacturers can usually change one or more to a filter of the user's choice.

True ultrawide lenses show no distortion of straight lines in the picture area, and this is a requirement that becomes more difficult to fulfil as focal length is reduced. The practical limit, in terms of angle of view, is 120°. At 118°, the 13 mm Nikkor comes fairly close to this. True wide angles with an even wider angle of view are unlikely to be introduced in the future, because they are extremely expensive. Today, many are available only on special order. Even a large manufacturer is unlikely to sell more than 20 of any one model per year.

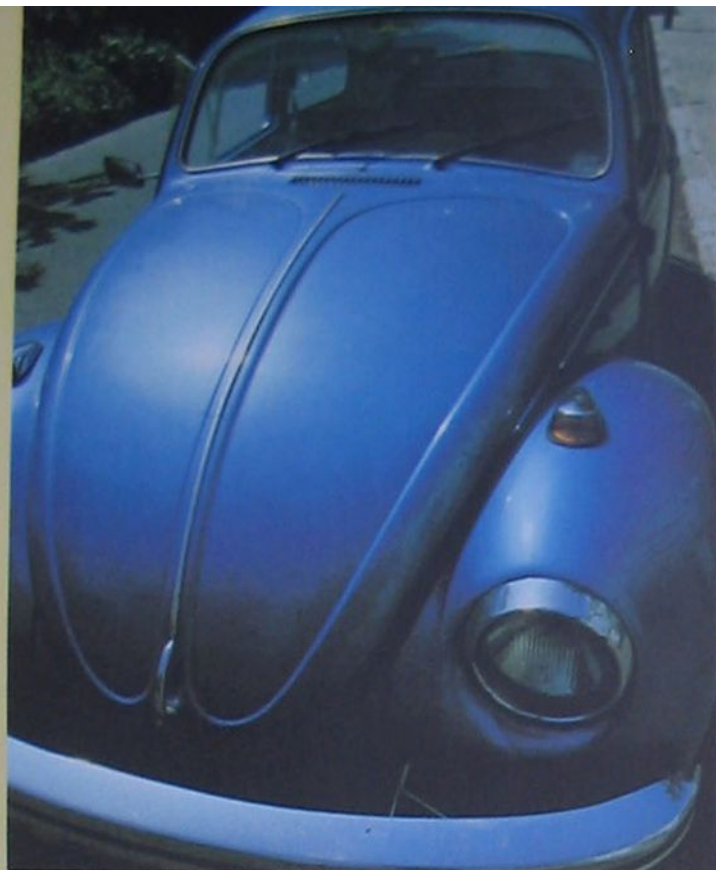
Fisheye lenses

Still wider views are achieved with fisheye lenses. These produce a characteristically distorted image, because straight lines on the subject bow outwards on the negative or slide. This uncorrected barrel distortion is unavoidable for such a wide angle of view.

Fisheye lenses were first made for practical applications, which stand out in marked contrast to the glamorous fashion pictures with which they are now associated. The original fisheye, the Hill sky lens, was used to make stereoscopic photographs of cloud cover. Other typical uses are for photographing the insides of boilers and pipes.

As with any lens, a fisheye forms a circular image. In some instances, the image fills the frame, but some fisheyes produce an image that is only 23 or 24 mm wide, at the centre of the film. Full-frame fisheyes are of more practical use to the creative photographer, but the circular type covers a wider angle of view—up to 220°—and is of more use in industrial and scientific applications. Invariably, both types have built-in filters, but focal length, maximum aperture, and other features differ widely between the various models.

A typical full-frame fisheye lens has an angle of view of 170°, a focal length of 16 mm, and a maximum aperture of $f/3.5$, but circular image fisheyes, because they are designed for specific applications, tend to be more exotic. A few have protruding rear elements, and must be used with the mirror locked up, but because they are often used on remote controlled, or unattended cameras, this hardly ever matters.



The standard The type of view taken in by the 'standard' wide angle lens—the 28 mm



Conversion Used with a 28 mm lens, a wide angle converter (top) and fisheye converter (above) give very wide views

Dave King/lens courtesy of Nikon

Dave King/lens courtesy of Transworld Trading Ltd

Focal lengths of circular image fish-eyes range from 6 mm to about 10 mm, and maximum apertures are small—about $f/5.6$. Often, exceptionally short focal length models have no focusing helicoid, which is unnecessary because of the extreme depth of field. A 6 mm lens at full aperture, for example, records everything in focus from infinity to 11 cm from the lens surface.

Panoramic cameras

Designed exclusively to produce wide angle pictures, panoramic cameras can be grouped into three types. The most elementary type is simply an ordinary camera with a lens that covers an exceptionally wide angle of view. Several different models are produced. Most of them are based on a Schneider Super-Angulon lens, which has a focal length of 65 mm. Other manufacturers make lenses of the same focal length, but the Schneider is by far the commonest. The lens gives wide angle results on the 5×4 inch format, and is fitted with a leaf shutter and a conventional iris dia-

phragm. These give shutter speeds ranging from 1 to 1/500 second and apertures in the range $f/5.6$ to $f/22$.

The various wide angle cameras that utilize this lens generally consist simply of a cone to support the optics, a sheet film holder, matt glass for focusing and an optional optical viewfinder. A helical screw built into the lens serves as a focusing mount. Cameras using lenses of this focal length include the Plaubel Wide Angle, the Sinar Handy, the Globus Super-Wide, and the Cambo Wide Angle 650. Some of these, such as the Cambo, have a limited amount of rising front but, generally, the lens is fixed.

A less common version of this fixed-lens—fixed-film system uses a 47 mm lens, but this covers only the 6×9 cm format, instead of the full 5×4 inch.

Although panoramic cameras utilize conventional formats, they produce pictures that are much wider than usual. The only camera to achieve such an outstanding performance with a fixed lens and film is the Linhof Technorama. This remarkable camera uses 120 rollfilm,

and takes pictures measuring 170×56 mm—nearly three times as wide as the standard 6×6 cm format, and covering a horizontal angle of view of about 90° .

The camera has a 90 mm $f/5.6$ lens and takes four exposures on each roll of film. Because the rays of light reaching the corners of the frame travel so much farther than those at the centre, the lens on this camera exhibits severe vignetting. To compensate for this problem, a filter is supplied with the camera. This has a neutral density spot at the centre, surrounded by clear glass. The filter serves to even out the exposure across the width of the frame. For its type, the Technorama is unique in its angular coverage, but its 90 mm lens can be used on any 25×20 cm (10×8 inch) format camera, and the resulting pictures cropped down to the same panoramic format.

Fixed-lens—fixed-film cameras are costly, mainly because of the exotic lenses they require, but they have considerable advantages over other types of panoramic cameras. They are virtually free from distortion, but



spherical objects in the corners of the frame appear oval, due to the extreme angle of view (see page 339). Where the correct rendering of buildings and other architectural features is important, then this type of camera is the best choice.

Another advantage is that the camera can be used in low-light conditions, because the shutter can be set for long exposures. This is not usually possible with other types of panoramic cameras, in which the lens or the entire camera moves during exposure.

A moving lens

The second way to produce a panoramic picture is to make the lens swivel quickly during the exposure. In this way, the lens need not have a very wide field of view, but the image is scanned across a wide area of film. Previously, many models utilized this principle though fewer have been made recently—the Widelux F7 and the Panon are examples. The Widelux F7 is fitted with a 26 mm f/2.8 fixed-focus lens, which revolves inside a narrow drum. The rear of the drum passes in front of the film, and incorporates a vertical slit which serves as a focal plane shutter.

The 35 mm film runs around half of the circumference of the drum along a curved path. The camera exposes film across only about two-thirds of this curved portion but, nevertheless, produces a picture that takes in an angle of view of 132° in the horizontal plane and 49° vertically. The pictures measure 24 × 39 mm, and on a 36 exposure roll, the camera makes only 21 exposures.

These 21 frames show some distortion (because of the movement of the lens) but this can be made less obvious by avoiding subjects with straight lines, or by directing the camera so that the optical axis is at an oblique angle to the sides of buildings.

The Widelux has an exceptionally wide angle of view, and is comparatively inexpensive—about the cost of a Nikon F3 and an extra lens. By comparison, the Linhof Technorama costs about four times as much.

The Panon camera corporation, which makes the Widelux in Japan, also manufactures the Panon camera. This works on a similar principle, but uses 120 roll-film, and is difficult to obtain.

Occasionally, other wide angle cameras that use the rotating lens principle become available second-

hand. The commonest of these is the Zenith Horizont, which was made in the USSR. This has a 28 mm lens and takes pictures measuring 24 × 38 mm on 35 mm film—an angle of view of about 120°. As with any secondhand camera, however, there might be problems of wear or accidental damage, so try the camera out before buying. A well cared for specimen could prove to be a bargain.

The main disadvantage of any rotating lens type of camera is limited exposure range. The Widelux has speeds of 1/15, 1/125, and 1/250, and a maximum lens aperture of f/2.8. Effectively, this means that with medium speed film the camera can be used only



Widest of the wide angles The Globuscope panoramic camera revolves through a full 360° in a little over one second

outdoors by day, or in brightly lit interiors. Fast film and uprated processing give an extra three stops, but in a dark church, for example, pictures would be impossible.

A moving camera

The other type of panoramic camera is that in which the entire camera revolves about a central axis. This design was once popular, and old models are sometimes used to take pictures of large groups of people. The subjects sit in a crescent formation around the camera, which revolves slowly on the tripod to make the exposure. The exposure is made through a narrow slit in the back of the camera. To compensate for the

movement of the camera body, the film is wound past the slit at a speed synchronized with the revolution.

Modern examples of this design revolve much faster. The main example is an American camera called the Globuscope, which spins through 360° in a little more than a second. The camera has a 26 mm f/3.5 lens and takes 35 mm film. Its horizontal angle of view is unlimited: as long as the shutter release is held down, the camera continues to revolve and expose film. Power is provided by a clockwork motor. A full 360° panorama occupies more than four conventional 35 mm frames, so the Globuscope takes only eight pictures per full-length roll.

Although the Globuscope takes in a full circle, it is limited in practice by a primitive exposure system. There is no shutter as such. Instead, the effective shutter speed is controlled by the width of a slit in the film plane. The plate that carries this slit is interchangeable, and the three different widths of slit supplied with the camera offer effective shutter speeds of 1/100, 1/200 and 1/400 sec. The maximum lens aperture is f/3.5 which limits the camera to outdoor daytime use. Furthermore, the shutter plates can be interchanged only when there is no film in the camera.

One other camera works on a similar rotation principle—the Arca-Swiss Roto which is much more sophisticated and expensive than the Globuscope. The Globuscope costs about half as much as the best 6 × 6 cm camera, whereas the Roto is four times this price. By way of compensation, it is a panoramic camera that does everything. It has an f/6.8 75 mm lens, producing pictures 56 × 475 mm in size. The slit at the back of the camera is adjustable in width, and further exposure control is possible by a TTL meter, which controls the speed of rotation of the camera.

The Roto has several other unusual features, including a shift lens. This is particularly valuable, because panoramic cameras cannot be tilted upwards—this would simply lead to half the panorama showing a higher part of the subject, and the other half showing the ground. By raising the lens instead, the camera can remain horizontal while taking a picture of a higher part of the subject.

One revolution of the Globuscope is usually sufficient to take in almost everything in the horizontal 360° scene



Assignment **INSIDE VIEW**



Photographing a simple room interior often causes problems for many amateur photographers so we asked Michael Freeman to show us some professional tips for tackling an ordinary living room—his own



Michael Freeman



Opening shot Direct sunlight looks nice but causes contrast problems. **Above left** Here, tungsten photofloods with an 80B filter. **Above right** Without the 80B the light was too warm. **Below left** Flash was bounced from the ceiling

Photographing your own living room or any room of average size is the sort of assignment that appears straightforward but can end up beset with problems. Since there are several ways of approaching an interior we asked Michael Freeman to demonstrate some of the possibilities, and the problems. Probably the simplest way to photograph any room is to use the window light as the main source of illumination. The complication with this is, however, that



Underlit Using flash is an ideal way of brightening the shadowed areas, but here the right part of the picture was underlit so Michael had to add a second flash, fired by a photocell



direct sunlight creates contrast problems—areas of the room in bright sunlight and other areas of dark shadow. However, for his opening shot Michael used just window light to show how it can be both pleasant and problematic. For all his shots Michael used a 20 mm ultra-wide angle lens on his Nikon F3—this focal length allowed him to include a wide field of view without distortion. To determine the right exposure for the Kodachrome 64, Michael used a spot-meter to take readings in various parts of the room. He found that at a shutter speed of 1/15 second the exposure readings varied from $f/27$ on the sunlit wall to $f/4$ around the small painting.

Since these extremes of contrast were so great, in his other shots Michael used several techniques to create more even lighting. By waiting until later in the day, the absence of direct sunlight helped considerably. Either photo-floods or flash provided the principal illumination—the house lights were just switched on for 'effect' lights. In all cases Michael varied the output of the flashes and bracketed widely—not just to allow for errors but also because it is quite common to find that the correct exposure does not necessarily give the best result.

For all the shots Michael took care to arrange the furniture to make a good composition and to check that all minor details were attended to. This included removing a painting framed in glass to avoid flash reflections and clipping a dead leaf from a plant. To make sure his compositions were balanced and that the upright elements were perfectly vertical, Michael fitted a focusing screen marked with a grid. Keeping the camera absolutely level is very important in order to avoid convergence with a 20 mm lens, so a two way spirit level was attached between the tripod and the camera.



Basic set-up For some shots Michael used a Bowens Monolite and a brolly but he also found that two hand guns would suffice. **Right** When bouncing flash from above, leave the ceiling out of the shot

Improve your technique

Metal and glassware

Metal and glass objects make attractive subjects for still life pictures. Lighting and photographing them can be difficult, but there are a few special techniques which make life easier

For those with imagination and patience, photographing still lifes can be an immensely satisfying occupation, giving individually 'crafted' images that are very much your own. Once you have mastered basic lighting techniques, you can usually put all your efforts into choosing and arranging subjects. But certain subjects such as glass and metalware, require a special approach.

Photographing glass

Glass containers make most drinks look instantly more attractive, but glass presents a number of problems for the

photographer. Glass must invariably be backlit to some degree. This is the only way in which to do justice to the material and its contents. Glass, because of its transparent (or sometimes translucent) nature only shows up clearly when lit from behind, underneath, or sometimes both together. Those golden glasses of beer in advertisements never seem to look as good on the bar counter, for this very reason.

Sometimes you may see a normally lit photograph shot in an advertisement but

the glass container holding beer, wine, perfume, cooking oil, or whatever, within the grouping still glows. This is achieved by the use of an accurately shaped white, silver or gold card reflector placed very carefully in shot behind the subject. Another technique is to have a hole in the background, or base, with a light shining through it, to achieve the same effect.

With glass objects you must use light-

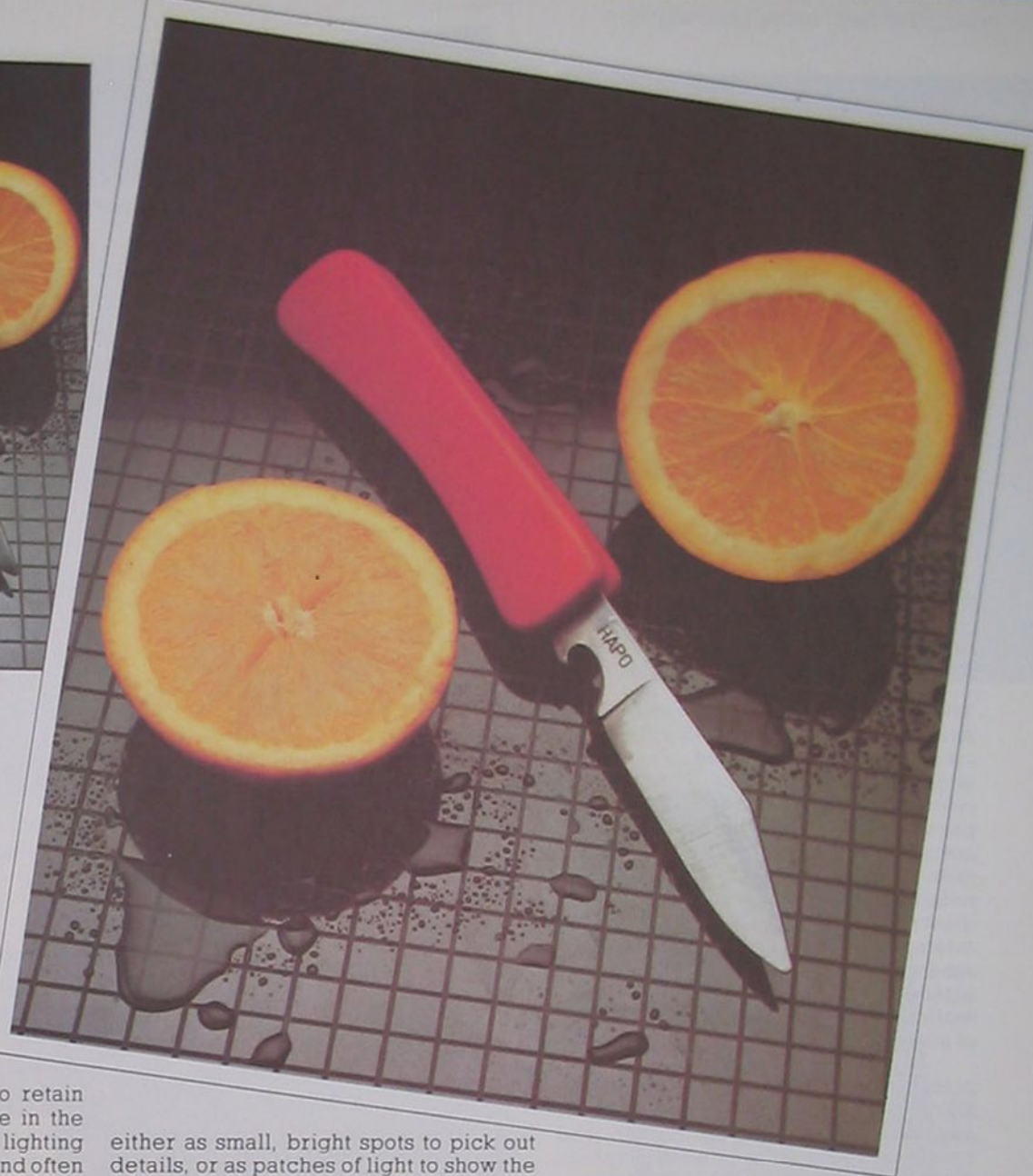
Adding black When you have a light subject and a light background, the edges of the subject tend to disappear (below). To overcome this, place pieces of black card around the subject (opposite page, bottom left) so that this card is reflected and so makes the edges darker. This gives a better outline and also helps to give a better impression of shape, particularly with rounded subjects such as the glass, here



Dave King



Cleaner cut Although the lighting in the above shot is adequate for most of the picture, the blade looks rather dull. To give a brighter, cleaner look to the metal, a silver card reflector was positioned out of shot (bottom right) so that it could be seen reflected in the blade. Positioning the reflector is best done while looking through the camera as its effect depends as much on viewpoint as on the position of the card



ing very carefully if you are to retain some idea of the object's shape in the photograph. Unsympathetic lighting results in the object looking flat and often confused. Backlighting helps by defining the edges of the object more clearly. But it is also useful to have some highlights on the front surface of your subject—

either as small, bright spots to pick out details, or as patches of light to show the overall shape.

To produce small highlights, use a second light with a mask over the front. The mask should have just a small hole in

it—maybe three or four millimetres across, though it is advisable to experiment with different sizes. If you are using tungsten lights, make sure there is some space between the mask and lamp reflector for ventilation, and keep checking that the mask is not getting too hot. If you are using flash, a modelling light is essential to determine the position for the light to get the best highlights.

An alternative is to use a torch, similarly masked, and double exposure. The first exposure is the normal one using either flash or tungsten. Then, with the room completely blacked out and the lights off, make a second exposure using the torch. Trial and error is necessary to determine the exposure for the torch, and you may find it necessary to filter this light if you are using flash as your main light. The correct amount of filtration should also be found by experimentation, but precise correction is not usually necessary.

If you are going to do a lot of still life work it may be worth making a special 'chair frame' table like that used by





Brighter cocktail With just the basic lighting set-up (above) the cocktail looks unexciting and dull, with little indication of colour. To liven up the shot a piece of mirrored card was placed in shot but behind the glass (below), so that it reflected light through the drink (right). Apart from making the drink look more attractive, this added highlight also has the effect of making the cocktail the centre of attention in the shot



professionals. This is a set-up which allows the subject to be lit from virtually any direction, including behind and below, and so is ideal for photographing glassware, as well as other subjects.

The basic structure is similar to an overgrown chair frame with the rear edge of the 'seat' frame missing. To

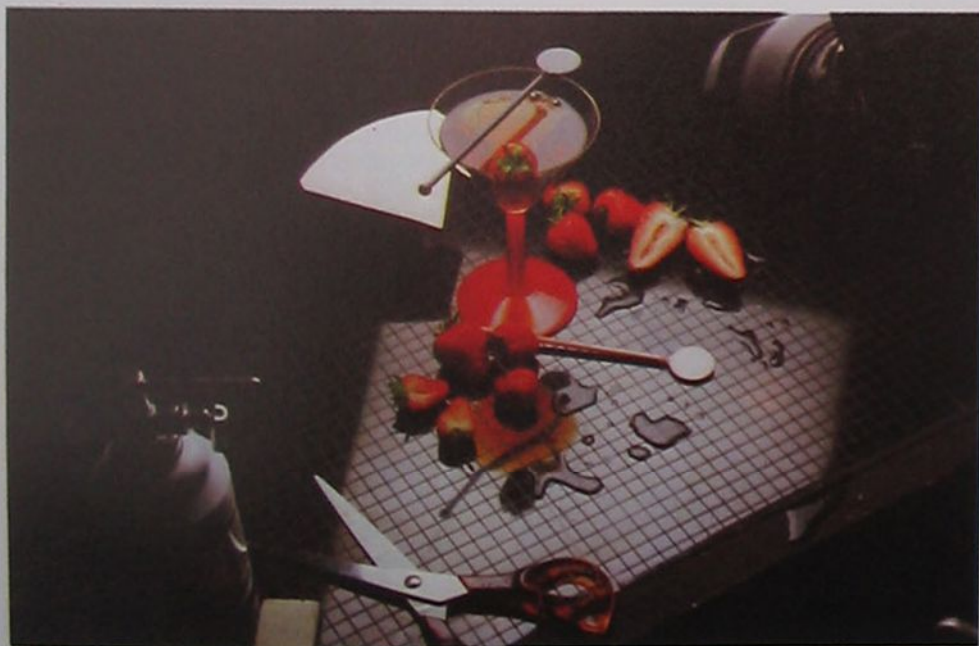
support your subject, lay a sheet of plate glass across the seat. Then lay diffusing material in a curve down from the chair back top to the front of the seat and fix it with tape or staples. The diffusing material can be tracing paper or one of

many plastic diffusers available in rolls from professional photographic dealers.

You can make the frame from almost any material, including wood, but make sure that it is strong enough to support fairly heavy objects. Further refinements include using more diffusing materials to add a translucent canopy, sides and front (with a hole cut for the lens) to create a 'tent' (see below).

It is useful to have a fair amount of space around this table to give sufficient room for the lights. If the lights have to be close, the lighting is likely to be uneven, giving 'hot spots'. If space is limited, the only alternative is to use additional layers of diffuser, but this restricts you to soft lighting. Fairly harsh lighting is often very effective with glassware, but has the disadvantage that it leads to strong shadows. This is where the chair frame set-up is useful, because, by adding a second lamp lighting the subject from below, these shadows are either burnt-out or made much paler. This second lamp can also be used for the main lighting source.

The technique of 'adding black' is most





necessary when the edges of a shiny object disappear into a light background. Reflecting black, grey or a colour into the edges can sometimes prevent this happening. The alternative is to use dulling sprays. These are aerosols of paraffin wax in solution and are made in a range of clear matt, semi-

matt and black. They are not very expensive and last for years. Do not use them on any mechanical or expensive subjects. Dulling spray can be removed with acetone (nail varnish remover) and a clean soft cloth.

Coloured glass It is very easy to introduce colour into a shot, even when the subject itself is very drab and monochromatic (below). With glass objects, place silver reflectors covered with coloured gels behind them (above) so that the colour is reflected through the glass (right). With other types of subject, the gels can be used as reflectors, similar to that used for the knife (page 2141) to add a hint of colour to selected parts of the subject



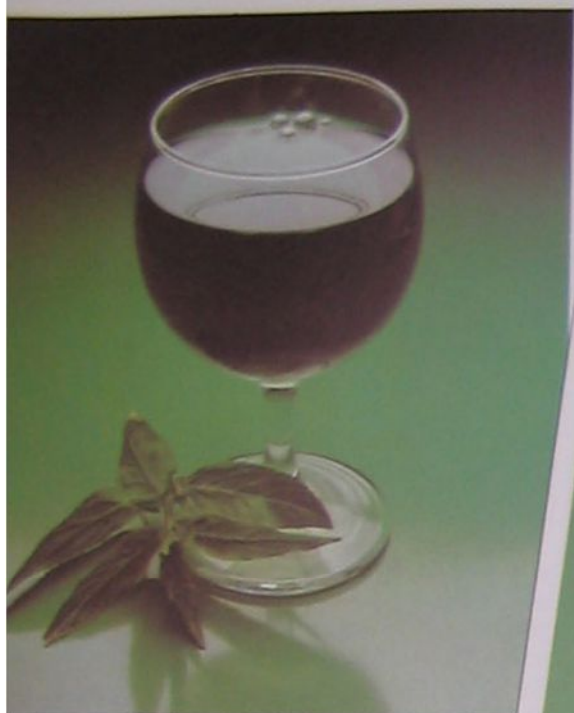
Silverware and metal

The photography of silverware has long been a problem, for no matter where one places a light, or the camera, everything within a 180° radius will be reflected in the subject. Old manuals of photography would recommend spraying the subject with milk, or rolling Plasticine over the surface to dull it. This had the effect of making the subject look washed out and lustreless as if it were made of pewter, or even worse, of clay.

Obviously the problem of reflections also applies to any other polished surface, whether it be brass, copper, chrome, aluminium, or nowadays, metallic finished plastic. The final solution to this situation was the invention of tent lighting.

Originally, tent lighting was literally just that—the set was constructed with a metal or wooden frame and covered with butter muslin. A modern tent, at its simplest, is a translucent drum for side views or a cone for top shots. Either of these can be made from tracing paper, or expensively ready-made in translucent acrylic plastic.





Reflected window In the shot above the glass looks flat and lifeless. This is mostly due to the lack of highlights in the glass. Fortunately, it is very easy to add highlights using card reflectors. For this shot a reflector was placed to one side (below), the card having been divided into four with tape to simulate a window frame. The size and shape of the highlight are controlled by altering the angle, shape and distance of the reflector



Dave King

In either type, a hole must be available for the camera lens to poke through. However, this immediately allows an image of the lens to appear in the subject! To stop this happening use a dulling spray to matt out the reflective area on the subject when using negative film, or, dodge out the unwanted image

when making the print.

Conversely, reflections can be put into glass or metal shots to give them sparkle in several ways. A long, thin highlight can be generated by placing a striplight close to the subject. A masked down

diffuser can produce the same effect. This is fairly easily done, but bear in mind that the shape of the subject itself may distort the shape of the highlight. This can be overcome by altering the outline of the striplight, of diffuser mask, with black paper and card. It is more than likely, that you will end up with a peculiarly shaped mask over the light source, in order to achieve a regularly shaped highlight in the subject when seen from the camera.

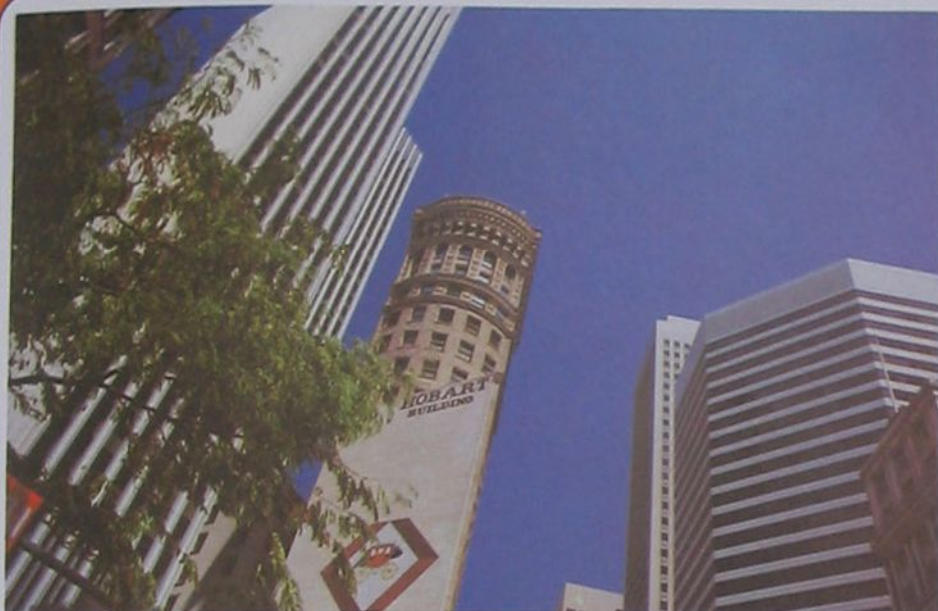
The same technique can be used in reverse, in order to introduce a controlled highlight shape into a dark glossy subject or background surface. Should the latter be of acrylic, or similar, it can be twisted to distort the reflection even more. It is worthwhile experimenting with some specially shaped cardboard cut-outs over a light source, in order to gain some idea of how this can work for you. Smaller highlights, for localized areas, can be induced by the use of handbag mirrors, cooking foil, or with silver, gold or coloured plastic reflective foils mounted on to pieces of cardboard.



What went wrong?

In the city

There is plenty of attractive subject material to be found in the city though few photographers take full advantage as Sergio Dorantes shows



The converging verticals of skyscrapers and a blue sky are two elements which, if well combined, always produce a visually interesting image. This type of picture has already become an often-employed cliché, so one has to be very selective if one decides to take such a picture. Consideration should therefore be given to showing quite clearly the intent of the photograph. This particular example is unbalanced, as the sky occupies a large portion of the picture area, creating an empty space which could have been better filled with a building. I would have aimed for a more graphic result, selecting an angle of view in which the tops of the buildings would converge at the centre and more toward the upper edge of the frame. Thus, an abstract image in which large white structures surrounded by thin strips of blue sky would have been achieved.



Here, the warm colour of the building plus the cool colour of the sky complement each other but this could have been used to better effect. The wall distracts attention and shows poor selectivity. With static subjects, it is very easy to find an organized composition. I would have framed the glass windows, the brick walls, and the sky in a parallel composition, producing a three-dimensional picture of patterns, light and colour.

One of the technical advantages of a telephoto lens is its ability to isolate subject matter with its shallow depth of field, while cropping tightly in the viewfinder. This photograph shows that a shallow depth of field was used in an attempt to isolate the road sign in the shot, but it does not show effective or striking framing. To the right, a building appears in the distance, destroying the whole composition. To shoot road signs successfully, they have to be shown in such a way as to give the picture some impact. One has to make use of their colour, their design, and their shape to make an arresting visual statement. In this case, I would have chosen a central composition, making the road sign dominate and framing so that the background was quite free of prominent and distracting structures.



NOTICE
THESE BUCKETS MUST
BE KEPT FULL OF WATER
AND USED ONLY IN CASE
OF FIRE.
BY ORDER

RE

FIRE

FP 13c

FIRE

FP 13/D

FIR

FP 13/E

Gina Lollobrigida

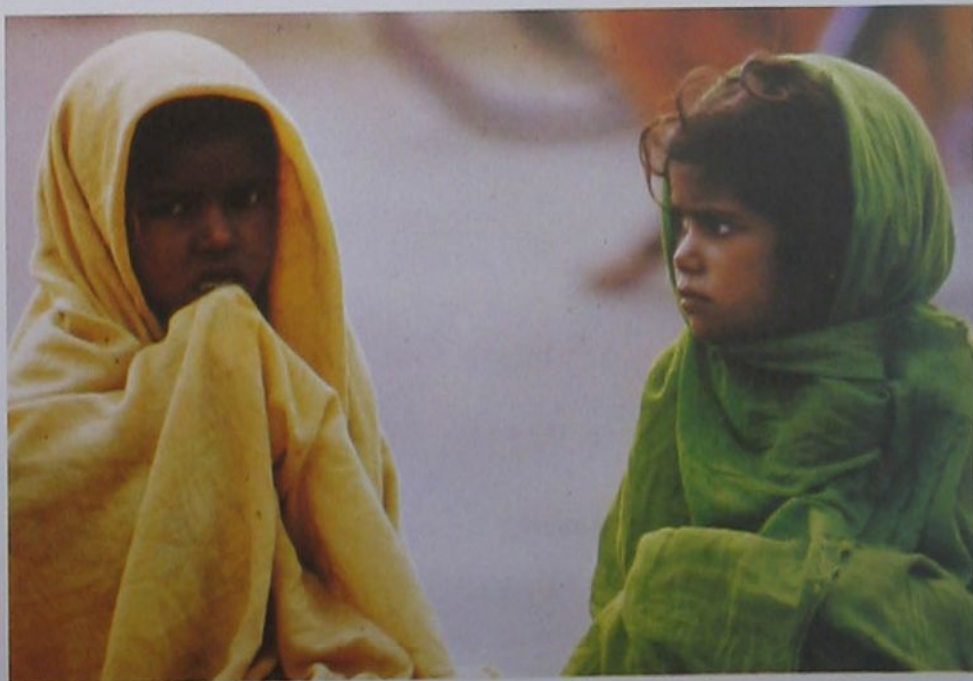
Already famous as an international film star, the actress Gina Lollobrigida is now gaining equal recognition for her photography which has been published in books and on the pages of leading illustrated magazines



It is hard to reach the top in professional photography—but to combine this with another equally successful career is a singular achievement. Yet this is what the famous Italian actress Gina Lollobrigida has succeeded in doing, seemingly without effort. After two decades as an international film star she turned her hand to photography, with the result that it has become her second and favourite career.

Born in a mountain village near Rome, Gina Lollobrigida entered the world of films by a classic stroke of luck—a film director spotted her in a Rome street and gave her an audition. She quickly became internationally famous. But the star of such films as *Belles de Nuit* and *Buona Sera Mrs Campbell* found herself at the top of a profession which she enjoyed, but which she had not chosen. Photography was to be very different.

Lollobrigida had studied fine arts, and her lifelong interests were painting and sculpture. So it was hardly surprising that being constantly surrounded by cameras she should start taking photographs of her own. She recalls: 'I like studying and discovering things. In the film world, it was me who was studied



Salvador Dali, 1977 A portrait of the photographer's friend Salvador Dali, the famous Surrealist, as he displays one of his paintings at his home in Cadaques, Spain

Children of India The etched, careworn expressions of these two young girls have been caught in a compelling and vivid image of the face of poverty

and discovered. So with no time for brushes and chisels, I began taking photographs'.

She began by photographing her son, then friends and relatives, then well-known people she met, such as the writer John Steinbeck and the painter Salvador Dali. She had already been taking photographs for a decade or so before she attempted to publish any of her work. 'In 1968 I was passing through New York when I decided to take some of my photographs to *Life* magazine. They were impressed, and commissioned me to do a series of photographs on how I viewed men. That was my first work as a professional photographer.'

Since then Lollobrigida has undertaken a wide variety of photographic tasks and has been equally successful at landscape, reportage, fashion, studio and darkroom work. Although she deliberately avoids devoting herself to any one type of photography for a long time, the bulk of her work is reportage. Recently, however, her photography has entered a less realistic phase, and she has started to experiment with photo-montage. She has not set cinema aside completely, but feels that photography is the most rewarding medium for expressing herself.

One of Lollobrigida's most successful books is *Italia Mia*, an off-beat collection of photographs in which she has attempted to show her view of Italy. It is a very different view from the normal survey of monuments, art galleries and seaside resorts. The book took three years' continuous preparation and the final selection of shots—out of a total of





China 1981 (far left)
Framed against a uniquely Chinese landscape, a young woman carries her baby on her back as she goes to work in the rice fields

Woman in a sari (left)
By isolating the woman from her background Lollobrigida has concentrated attention on the strong colours and sensuous folds of the sari

Fidel Castro, 1974
Taken in Cuba while Lollobrigida was making a film profile of the famous revolutionary

20,000 negatives and slides—was less than 200. For the majority of the photographs, Lollobrigida had to shoot in disguise because she was such a familiar face to most Italians. She used a variety of wigs and shabby clothes, but found that the most effective trick was to put plum stones in her mouth—the resulting puffed-out cheeks rendered her unrecognizable.

As well as *Italia Mia*, Lollobrigida has put together several other books. *Le Filippine*, a reportage on the Philippines, was put together in less than a year. To do this she had to work seven days a week for most of that time. The result—50,000 photographs from which to make the final selection. She has also produced a book on Manila, the capital of the Philippines, and one on Cuban president Fidel Castro, *Portrait of Fidel*. *Italia Mia* represents Lollobrigida's personal style of reportage well. As the primary photographic subjects, people dominate her pictures, although set against the background of the Italian



Gina Lollobrigida

Rapt attention (far left)
A touching portrait of two young girls from a small village in the Philippines taken for Lollobrigida's book on the country, 'Le Filippine'

Lima 1979 (left)
The bright red of this Peruvian Indian's skirt brings life to a simple picture of a street seller in Peru's capital city

landscape. Lollobrigida devotes the same amount of attention to a slum street in Naples as she does to a portrait of a public figure. People are her primary interest and photography is her way of recording their daily lives. She has little time for the standard tourist attractions, unless they contribute to the meaning of a photograph. St. Peter's Square in Rome, for instance, provides an ironic background to a shot of a group of young priests having a snowball fight.

For Lollobrigida, photography is a constant process of discovery and she is fascinated by the way in which one subject can lead to another. This is true even in her own country. One day, by the

Colosseum in Rome she stopped to photograph a couple of newlyweds who were walking in the sunshine. While photographing them she suddenly caught sight of a group of cab drivers. They had set up a camp fire and were cooking their lunch among the ruins. However, she had barely caught some shots of this scene when she noticed a group of people pointing to a man sitting on top of the building—he had climbed to the top of the Colosseum some days before as a protest against being refused a work permit.

Thus for Lollobrigida photography combines two great pleasures—the chance to constantly rediscover the world around her and the opportunity to always be involved with people. She also likes to carry this sense of involvement into the photography itself and is keen to emphasize this. While many photographers think it important to remain detached from their subject matter, especially in reportage, Lollobrigida not only feels involved but tries to photograph with as much feeling as possible.

However, she prefers to avoid photographing extreme examples of human misery as she feels that this kind of sensational reportage is in bad taste. An example of this was her refusal to photograph the effects of the major earthquake that occurred in Italy in 1980.

Lollobrigida does not recognize any particular photographic influence on her work. She admires the work of W. Eugene Smith, Cartier-Bresson and Sam Haskins but she does not feel that her work has been influenced by them. However, she does think that her style of photography has been influenced by painting and by the cinema. She feels that painting has given her an eye for colour and composition which she would not otherwise have had. From working in the cinema, on the other hand, she has gained considerable knowledge of lighting and of the importance of a point of view. 'In a sense, a photographer is like a film director—he must know how to select images to tell a story.'

In her reportage photography, Lollobrigida feels that speed is essential—certainly many of her shots bear this out and she has taken some remarkably effective candid street scenes. When she has more time to shoot, she composes carefully as she dislikes cropping and feels that the photographer should be able to compose almost all shots in the camera. In order to give herself maximum freedom of composition, she uses a number of lenses, rarely limiting herself to only one lens or viewpoint for a given subject.

Although she feels that composition is very important at the taking stage, Lollobrigida sets great store by darkroom work. She does all her own developing and printing, both in colour and black and white, and greatly values the flexibility and control this gives her. Apart from darkroom work, however, she is not interested in technique for its own sake, and rather wishes someone

Pipe smoker *This sympathetic portrait taken at Baggio in the Philippines has caught the humour and warmth of this old woman's character*

Indian summer *Youth and age framed beneath floating banners swinging gently in the breeze*

Elegant timing *Lollobrigida used her unique system of photomontage to create this publicity image for Piaget*

Mother and child *The lively face of this young Kenyan tribeswoman makes a fine portrait*





would invent a camera which could take care of all the technical aspects of picture taking, leaving the photographer completely free to concentrate on the main subject.

In the meantime, she uses a very wide range of cameras and lenses. Apart from Nikon bodies and almost the entire range of Nikkor lenses, she also uses a Hasselblad, a Pentax 6 x 7 and, for studio work, Sinar monorail cameras. When travelling, she takes six Nikon bodies, with all the lenses from 24 mm to 500 mm including one of her favourites, a 300 mm f/2.8. She also particularly likes the Nikon 55 mm macro lens, because of its powers of resolution. She always uses a motor drive, because it gives her greater stability, and because she finds it tiresome to continually wind on film manually.

As well as her cameras, Lollobrigida has a whole bag-full of custom-made filters for both black and white and colour work. Among these are special warming filters which she uses when working with Kodachrome. When shooting in monochrome, she uses Tri-X or Plus-X. Although she has a very comprehensive photographic outfit, she is not interested in equipment for its own sake—indeed, one reason why she needs so many cameras is because she treats them rather carelessly and they tend to break down. She never uses an assistant when travelling, except to carry her heavy gadget bag full of lenses. However, she does have assistants working for her at the professional studio she has established in Rome—Studio Gina Lollobrigida—which was set up recently to handle Lollobrigida's fashion and advertising work. She plans to find time to do this while continuing with her travel and reportage work.

Lollobrigida also plans to keep her less commercial interests alive. Painting has always been important to her and she hopes to keep producing new work. Her photography too is being influenced by aesthetic concerns. She enjoys working in the darkroom and, lately, she has been working on some new photomontage techniques.

Lollobrigida sees her work becoming increasingly imaginative, and less and less to do with realism. Recently as a result of her increasing interest in photomontage, she has developed a personal technique for superimposing one image on another. This technique is the result of two years' experimenting in her darkroom and she refuses to disclose how it works, except that it is done by means of masking.

Even though an acting career has been her route to stardom, Lollobrigida is quick to confirm that it is her photography that has brought her the most satisfaction: 'In films you are at the mercy of a director, whereas a photographer is alone.' Thus, being able to develop her photographic interests will continue to be the most important aspect of her creative life.



Hiring studios and models

Hiring a professional studio, equipment and model can increase the scope of your photography considerably. But you should know what to look for before you start

One way to avoid the expense of setting up and equipping your own studio is to hire one. A well-equipped studio can broaden your scope and improve your creativity, and for some types of work it is often a necessary aid. But few amateur photographers have the space in which to set up a studio, and fewer still can afford the cost of studio equipment. Nevertheless, any specific need for a studio can be met by hiring—but beware the many pitfalls that can beset you.

Even if you already have use of a studio, you might still have occasional need to hire a different one for specific types of work. Your own studio might be too small or inadequately equipped, in which case you will need to hire a professional studio. These are usually equipped to suit most typical jobs but there are many that specialize.

Choice of studio

Your choice of studio depends much on whether you live in a large city or in a small provincial town. Usually, there are a great number of studios in and around cities, often close to centres of commerce, publishing and entertainment. Such a wide choice is to your advantage but only if you take the trouble to match the services offered to your requirements. If you are attracted by an advertisement for studio hire, or if you are booking for the first time, arrange to view the premises. Beware of

Dave King



Amateur studio The essentials of a small amateur studio include a clear floor free from obstructions, a high ceiling, plenty of space for equipment and complete control over the amount of daylight entering the studio. Large windows are useful, but must have blinds to block out light completely

Large professional studios are expensive to hire, and they are usually booked several months in advance, but the type of facilities they offer might be necessary for some amateur work. Photographing a car, for example, requires bulky, purpose-built reflectors to give a uniform diffused lighting, and plenty of space

Dave King



Studio equipment To make the most of a hired studio you will need plenty of equipment, such as shown right. This can be hired along with the studio itself but may be charged for as an 'extra'

garages, spare rooms or offices converted into a studio, because these can prove to be more of a hindrance than convenient places to work.

In rural areas or in small towns, your choice might be limited, but you might, nevertheless, be able to hire a suitable studio at favourable rates. In some instances, a local professional may offer his studio for a limited hire period, in the evenings after shopping hours when his work might switch to the darkroom, for example. Some local studios may also close for one day a week, extending a hire facility perhaps supervised by a darkroom technician. Restricted hire times such as these are often booked fully and you may have to wait several weeks for a session.

Camera clubs and art schools often have well-equipped studios and equipment. Often they make their premises available for courses on lighting and portraiture. These provide a good means of learning studio photography at low cost and with professional guidance. These establishments might welcome the chance to hire to amateurs or professionals, as a means of offsetting the cost of running the studio.

Whatever your choice of studio, it is important to remember that the more extensive your preparation and planning before hiring, the more you are likely to avoid problems and unnecessary expense. Only by careful planning can you decide, for example, what size studio to hire and for how long.

Basic requirements

Sufficient studio space is essential if you are to work efficiently and creatively and in reasonable comfort. A surprisingly large amount of space is required around a subject for lights, screens and other accessories. For some creative work, you need a distant, hard light; for others you need large diffusers placed well back or high above floor level. Low ceilings restrict the use of lighting and hamper composition—small rooms force you to render the subject too close to the background. In portraiture, for example, you are likely to use a telephoto lens, which requires a considerable distance from camera to subject for framing.

Not all amateurs can visualize the dimensions of a studio and assess whether they are suited to their needs, so you are advised to visit several studios and study the different sizes and layouts. If you intend to build a large room set, for example, the most suitable studio would be one offering a multiple choice of suspended mock walls and slotted ceilings with a choice of different sizes, wall decor, windows, doors and furnishings. Such a studio would also have props, such as furniture, ornaments, books, workable fixtures and fittings.



Theo Bergstrom



Theo Bergstrom

Studio kitchen If you intend to photograph foods, a built-in studio kitchen is essential. Many studios have a basic sink unit but relatively few are as well equipped as this specialist one

Space to shoot A surprisingly large amount of space is required to photograph even small objects. Much of it is taken up by equipment such as support stands and lighting gear



Dave King



Choosing the right model for a particular job requires skilful judgement. But to help you decide, agencies send out catalogues and cards showing photographs and statistics

Some of the cheaper studios may put you in contact with part-time or amateur models. But such people are rarely able to cope with the demanding task of posing. This is a great disadvantage, particularly if you are also new to this type of photography. You are more likely to benefit if you work with a well-experienced model. This might mean hiring through a model agency.

An agency can offer a wide selection of highly professional and experienced models. Most good agencies keep catalogues, which give details and

Booking After short-listing potential models, speaking to them, or the agency, will help you decide who to book

Powerful lighting may be required to simulate daylight or even sunlight through windows. This requires large banks of lights such as *fishfryers* and *swimming pools*, which take up large areas of space.

These studios are large enough to accommodate several room sets simultaneously. They tend to be on a ground floor location and are easily accessible in order to take large items that might be part of a set. Indeed, some are large enough to stage, for example, a complete road scene including lorries, cars and many other large props.

Many studios offer basic photography equipment for hire at an additional cost. Usually, however, it is preferable to use your own equipment, with which you are acquainted. Background materials such as paper rolls normally need to be bought from the studio at an additional charge. This is because the paper soon becomes spoilt and is expensive to replace. Many of the larger studios provide paper rolls up to 3.5 metres wide. If you need to shoot on large format, such as 6 x 6 cm reflex or 5 x 4 inch monorail view cameras, make sure that Polaroid backs are available from the studio. Polaroid film checks help you to monitor exposure, composition and sharpness before exposing your film for the final result.

If you are inexperienced in the handling of complicated camera and lighting equipment, some studios may require you to hire a technician and assistant. Although this will add substantially to your hire fee, it is also time saving, and safeguards against breakages and fouling up of equipment through misuse. You are liable to pay for any damages, whether or not an assistant is present, so it is important that you obtain insurance cover for any such incidents and for injuries to personnel.



Hiring a model

If your session in the studio requires a model, you will need to be equally thorough in planning to hire one. It may be to your advantage to hire a studio that employs models or has a list of models, giving measurements and pictures to help you choose. By this method, you will simplify the hiring procedures because you deal with only one hirer.

pictures of models, occasionally informing you about past modelling occupations. More insight about a model can be obtained by looking at their show cards, portfolios or book. These contain the best of a model's work and enable you to judge the model's aptitude to adapt to any situation or setting.

Usually, agencies specialize in the type of work their models do—such as

Interviewing models is a way of assessing their suitability for the job.

Facilities (below). At the very least, you must provide a changing screen and well-lit mirror for the model

glamour, nude or fashion. And the models themselves have specialities. These include hands, lips and legs. The best models will usually work through an agency, but besides the expense of hiring them you might discover a persistent reluctance by model agencies to provide models for amateur photographers. The reasons for this range from a general lack of professional attitude to unreliability, a high cancellation rate and a high chance of accidents by amateurs. Another concern is that while working with an amateur,



by both the model (or a parent or guardian if the model is under the age of majority) and the photographer. The form states that the model has no copyright over the pictures and gives the photographer permission to reproduce the photographs, or to sell them to someone else. This may not seem important at first, especially if you are shooting mainly for your own enjoyment. But should you want, at a later date, to have the pictures published in a book or magazine it is as well to have model release forms signed.



Receipt and Disclaimer

I hereby declare that under Commission to agency Photo Models Incorporated, Instead Rise, Kingston-on-Thames, England for pictures for Camera Festival

from: _____
taken by the photographer Piers Thornton Productions, London

I have received the sum of _____
At the same time I hereby give my consent for the above pictures of portraits of myself, or altered or unaltered reproductions of these pictures, to be distributed and published for advertising purposes without restriction to any particular sector and time by the above-named firm or by third parties acting with the latter's consent.

I hereby declare further that the fee paid to me today satisfies all claims I have or may have on the above firm and on third parties who, in producing, distributing and publishing the above pictures, act with the latter's consent.

I waive the right to have my name stated, but I also give my consent for my name or another name to be mentioned in connection with my pictures.

_____, the _____

(Address)

Signature

they might have to forego more prestigious work.

The greatest obstacle to the amateur hirer, however, is the cost of professional models. The more a model specializes, the higher the fees become. Rates for models are calculated per hour and include the agency commission.

For the hirer, a most crucial document is the *model release form*. This is signed

Model release form *If you want to sell pictures from the session, the model must sign a release form giving you the picture rights. You can draw up your own form based on the example shown here, or modify it to suit*

Railway museum

Stuart Windsor shows how a varied range of shots on the theme of machines can be created with minimal equipment

Whether the subject is a railway museum, a collection of historic aircraft or motor cars, photographing details of beautifully designed antique machinery is an ideal subject for an assignment. This particular set of shots was taken by professional photographer Stuart Windsor at the National Railway Museum at York in the north of England.

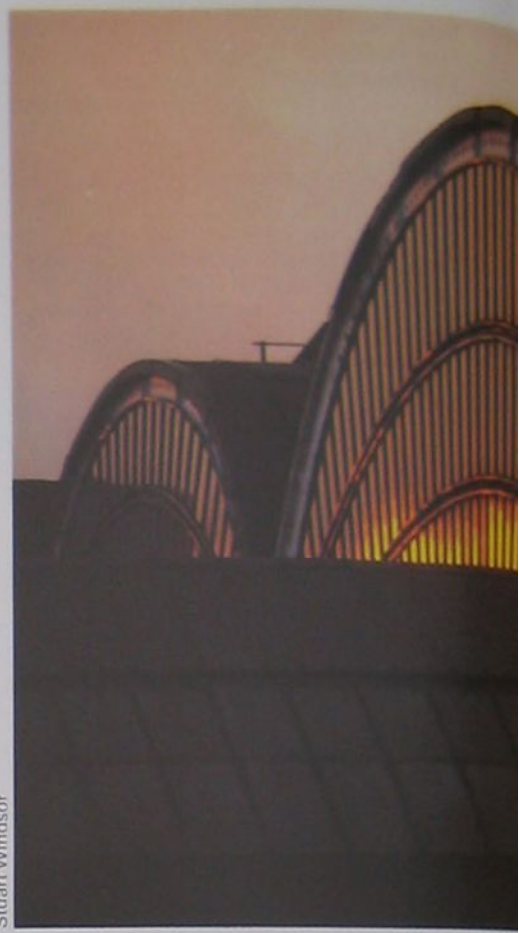
This was Stuart's first visit to the museum but he quickly found that his expectations of finding good subject matter were well justified. After walking around to inspect the range of exhibits, he decided on a basic approach. He explained, 'I wanted to do justice to the designers of these trains—both the engineers and the livery artists. They gave the railways of the past such strong visual impact which I found could be captured by focusing on details and treating the assignment more like a still life exercise.'

Ease of access to all the exhibits meant that Stuart only had to take along a minimum of equipment—20 mm, 24 mm and 55 mm macro lenses and two Nikon F2 bodies, one loaded with Kodachrome 64 and the other with Ektachrome

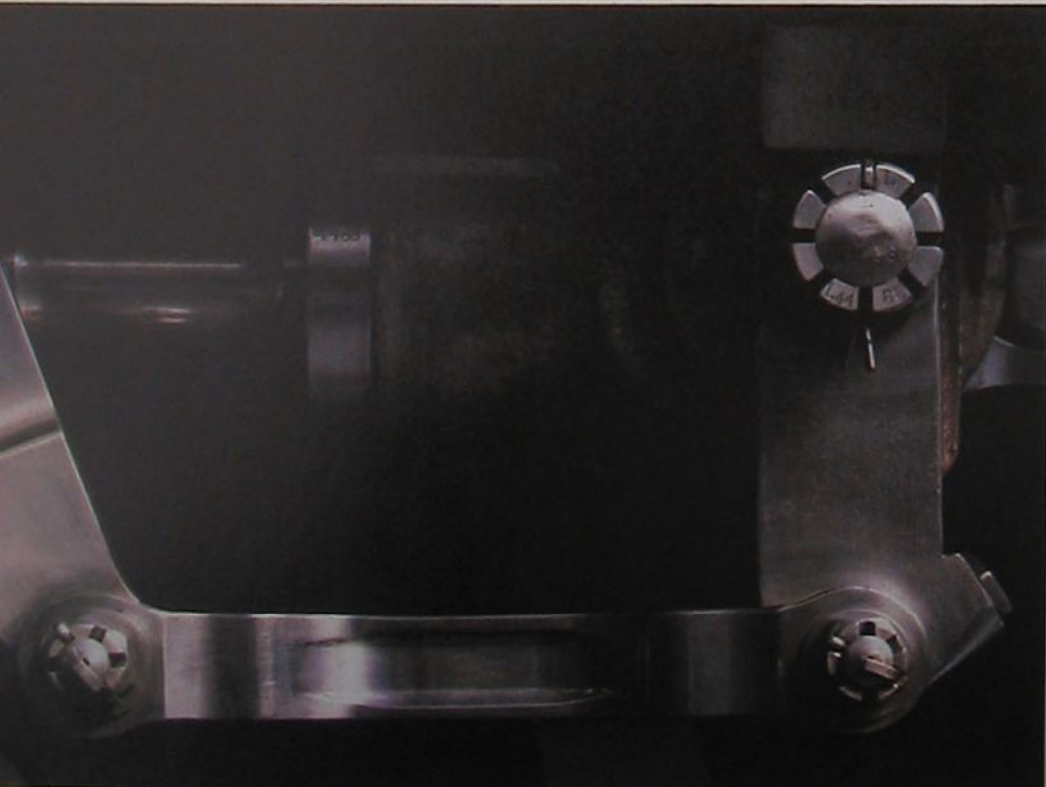
200. All the shots were taken using available light which came from the skylight above—and the rich, glossy paintwork of the exhibits suited the Kodachrome. However, for a few particular shots—such as the Mallard's coupling rods which were made from satin finished steel—Stuart switched to the Ektachrome to soften the overall effect. The high contrast and fine grain of Kodachrome would have given a hard edge to these rods.

Another aspect to the assignment emerged after Stuart had actually left the museum. He explained, 'After I had finished the day's shooting, I drove back past the Victorian frontage of York's railway terminus as the sun was setting. While this was not strictly part of the Museum it was a comment on York's railway heritage and provided a superb link with the striking visual qualities of antique railways.'

Coupling rods To give a softer look to the matt steel, low contrast Ektachrome 200 was used. **Buffer to buffer** A 20 mm lens helped Stuart give equal emphasis to foreground and background

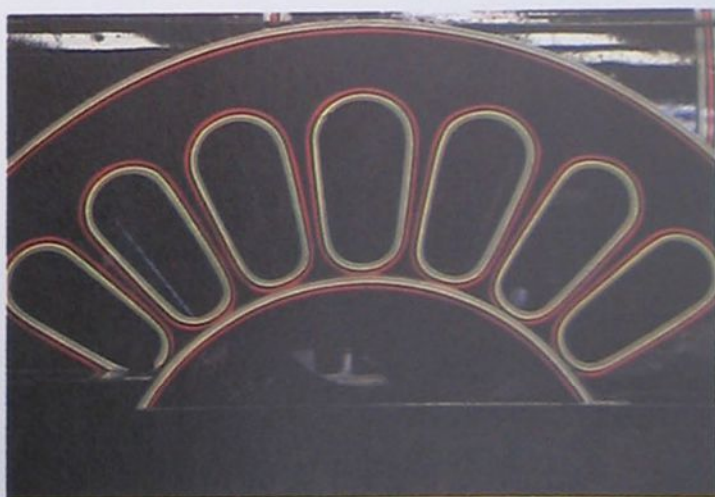


Stuart Windsor





York railway station *The design of the roof and the light of the setting sun helped produce this graphic shot.*
Coachwork details *For all his close-up work, Stuart used either 28 mm wide angle or 55 mm macro lenses*





Creative approach

PORTRAITS

Many people feel that there is a limit to how creative you can be when shooting a formal portrait but this view overlooks the wide range of approaches embraced by this area of photography

The very idea of taking formal portraits fills many photographers with horror. The word 'formal' itself suggests something straightlaced and rigid, out of the Victorian era, and possibly even with clamps to hold the subject in place. Or one thinks of the portrait taken at school, where the photographer set up a

standard plain background and lighting arrangement, and every child had to sit in a standard way.

Yet even in Victorian times some photographers were beginning to let their subjects 'breathe', and the portraits of well-known people taken by such photographers as Julia Margaret

Cameron are far from the stylized mould. Today, there is a wider range than ever, and it is hard to tell where the formal photograph ends and the candid shot takes over.

Most formal portraits, however, are better termed 'posed' photographs. Here, the session is set up with the aim of

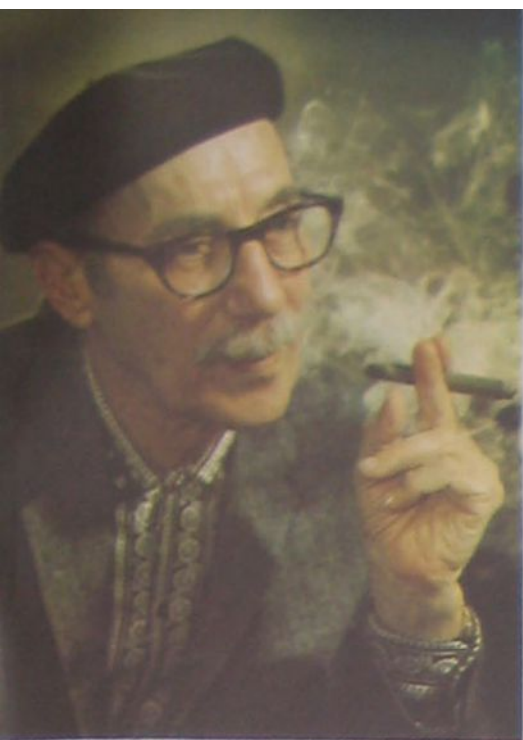


Folded arms The position of the arms can add an extra means of expression. Note the way in which the staircase has been used in the composition

Smoker By positioning the subject's head high up in the frame, the photographer has been able to feature the hand as part of the shot

Lady at home The subject's own surroundings often prompt a more relaxed pose. However, be careful to avoid distracting backgrounds

Frame within frame To make a statement about the man and his work—he is an architect—the photographer created an organized, graphic shot



Penny Tweedie Colorific

taking the subject's picture, and the subject expects to cooperate with you in order to achieve this. The traditional portrait is taken in the studio, or at least a temporary studio, but it is quite possible to take formal portraits outdoors (see pages 168 to 172) or in a room (see pages 756 to 760).

Studio photography is in many ways the hardest of all types of portrait photography—paradoxically because so much is under your control. You must attend to every part of the picture, instead of letting the background worry about itself or putting up with whatever light happens to be around at the time. For both you and the subject it is a novel



Clay Perry

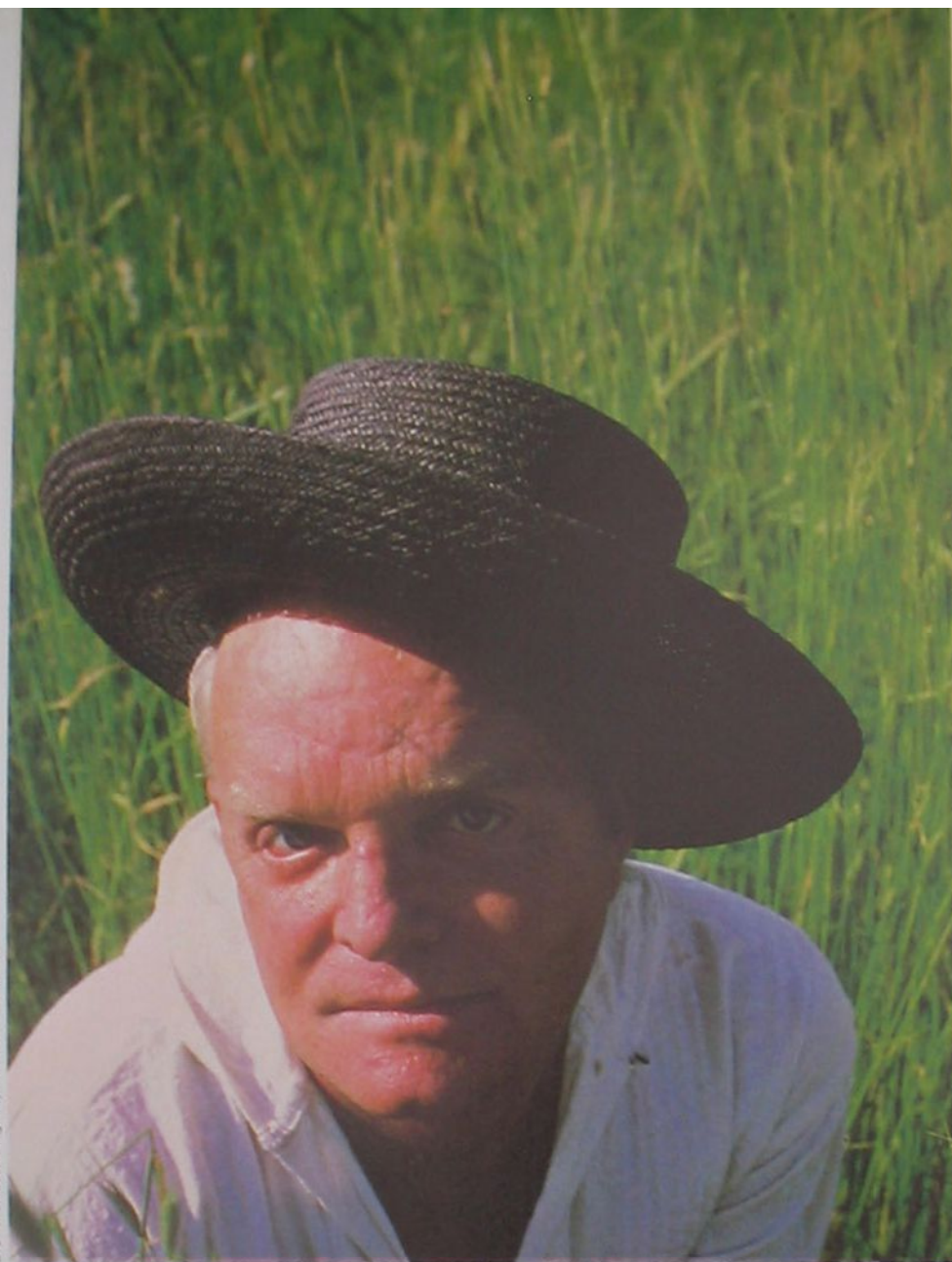


Magda Sagal

experience, which means that you must pay great attention to detail.

A professional portraitist, for example, will even wear clothes which are appropriate to the session, in cases where a stranger is to be photographed. A judge or mayor, for example, may well respond better to a photographer wearing a suit than one casually dressed, while the owner of a trendy wine bar might be the opposite.

You should also take a professional approach to the session, even when photographing a friend, in the way you set things up. It is vital to prepare the set thoroughly beforehand, so that your subject does not quickly get bored with the whole thing. You ought to have some sort of idea what kind of pictures you want before you start. This is easier in the case of friends than of strangers whose personality you have no idea of until you meet them. A true character study, rather than a simple likeness, means much more than putting your subject on the ready-lit set, however. It is important to be able to make rapid changes to the set-up during the session as the subject's personality emerges, and again this means having things ready beforehand. To start with, it is best to



Truman Capote *The shape of the hat and the positioning of the subject low in the frame created this striking composition*

photograph a range of friends, experimenting with showing their characters in different ways, before tackling portraits of strangers.

The problem of assessing your subject's character is central to the success of the portrait. Different photographers have different ways of doing this. Inevitably you form snap judgements, in which case you are likely to portray the personality that the person is trying to project rather than their true inner self. Your ability to judge people and to get on with them is not the sort of thing that can be developed in any way other than by experience, however. It is safe to assume, though, that if someone dresses and behaves in either an aggressive or timid way, that they will be quite happy with portraits which reinforce those characteristics.

There are also different ways of handling the session itself. It is usually preferable to talk directly to the subject, and to get them to respond to you, rather

than to the impersonal lens of the camera. This means using a tripod, so that you are not hidden behind the camera as you speak. Having focused, take your eye away from the viewfinder and talk normally to the person. Once you have the pose looking good, you can ask them to look at the lens for a picture which you take using a cable release, without even looking through the viewfinder.

On the other hand some portraitists will virtually ignore the camera, and will bustle around attending to various details so that the subject is caught virtually off guard and does not assume a fixed pose when the cable release is pressed. This method tends to produce a rather serious portrait, since the subject has made no effort to look pleasant or interested, but it may reveal more personality than a posed shot, since the subject is less self-conscious.

When faced with your subject, often the hardest thing is actually getting the session under way. Even professional portrait photographers can have this problem, and one solution is to have a stock of poses which you know work

well. The beginner does not have such a stock available from experience, so a useful alternative would be to collect a library of poses that you like and show them to your subject. If the pictures are good they will probably be quite keen to be photographed in such a way, and will instantly get an idea of what you want. Having established common ground, you can then explore various possibilities, developing an idea from a basic theme.

The subject's personality can be revealed in a wide variety of ways by the pose itself. There is no secret to discovering such poses—they are mostly fairly obvious. A subject who leans forward will appear aggressive, while one who leans back will appear either relaxed or submissive.

The graphic appearance of the body and clothes also have considerable effect on the viewer. Rounded shapes are soft and are often thought of as feminine, while sharp or angular patterns, with cutting edges, are aggressive or masculine. These shapes can be produced by the subject's arms or legs, often subtly. Arms, for example, may be folded across the chest to produce an angular, aggressive effect; or hands can be cupped around the face to give a pensive, possibly shy look. Including a subject's hands in a close-up shot introduces another element to what might otherwise be a rather bland picture of a face. The angle from which you take the shot can also affect appearances. Cecil Beaton, the English society photographer, often photographed women from above eye level because he said it made their faces appear heart-shaped. You can experiment with your subject by trying the same pose from above eye level, moving down as far as waist level. Given the



Brian Griffin



Man and his music While backgrounds should usually be kept simple, there are always cases for breaking the rules

Fashion designer For portraits where the subject is positioned centrally, try using the surroundings as a frame

Singer's profile The sweeping lines formed by the arms balance the composition and give it strong, graphic qualities



Clay Perry





Window light
Daylight can be a very effective light source for portraiture and can also allow you to use the window itself as part of the shot

Young girl Flash can also be used in a way that simulates daylight. Here the directional illumination has been used to bring out the texture in the wall and to cast unusual, striking shadows

Lana Turner This has all the elements of a classic portrait—careful lighting, composition according to the rule of thirds and the bold shapes described by the subject's limbs

individual, rather than reveal aspects of character. In this case, extremes are undesirable. A standard rule among portrait photographers is that you should never allow the subject to look down on you. Double chins become pronounced, wrinkles sag and you find yourself confronted with distended nostrils. If in doubt, therefore, you should keep your viewpoint at or above eye level, foreshortening the face. Other techniques for flattering subjects are to use diffuse, fairly frontal, lighting to soften wrinkles, and to keep the main lighting above eye level, but not so high as to produce shadowed eye sockets. Bear in mind, too, that dark skinned people often prefer to appear lighter, while a fair skinned person will usually like to appear to have a tan. Ask your subject whether they have a good side, and ignore this information at your peril!

In formal portraits, backgrounds should be kept as simple as possible—unless you have a particular interest in trying to relate the subject to his or her surroundings or interests. Generally, the best background is either a plain wall or background paper—or even an expanse of sky. Watch out for distracting

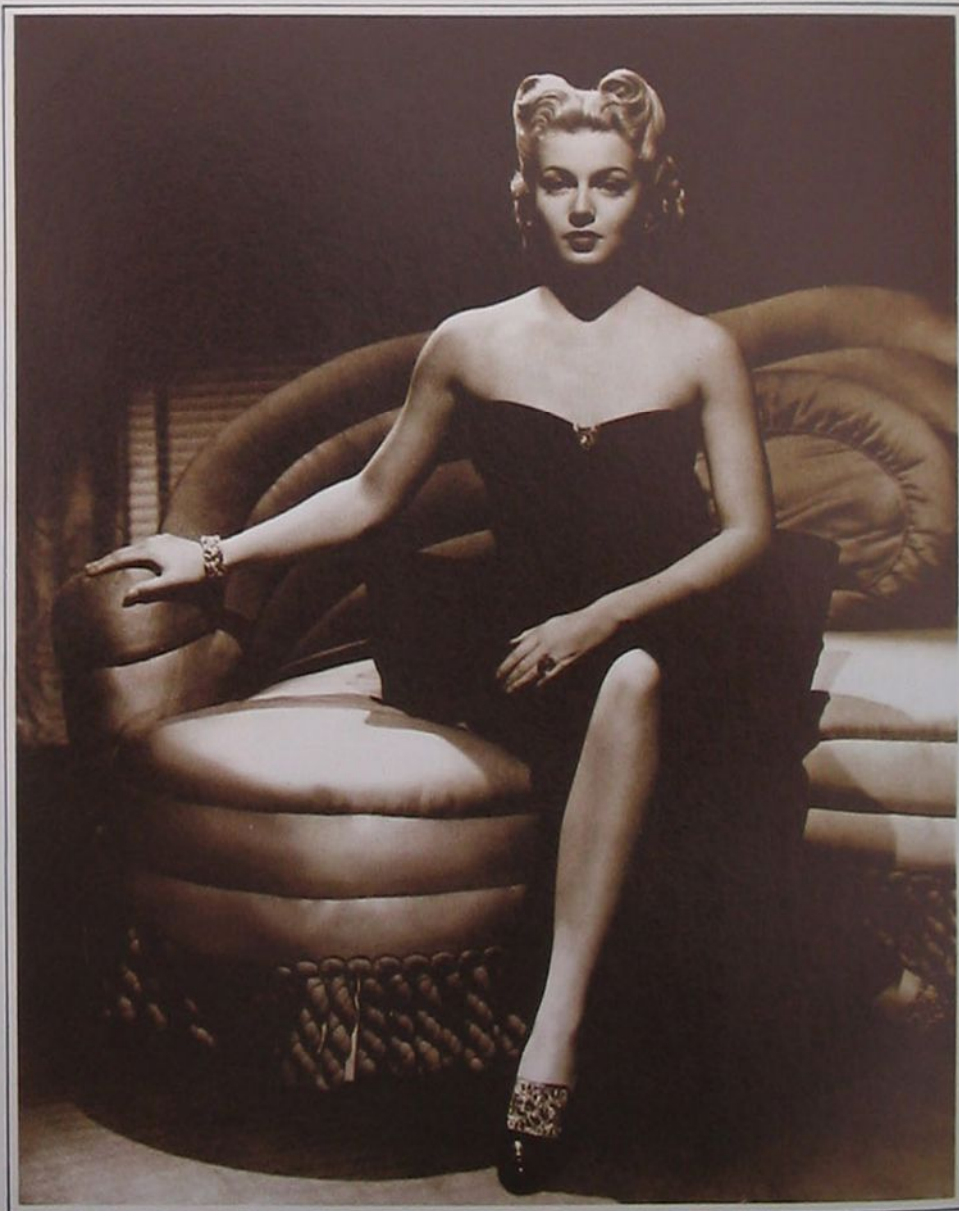
fairly long focal lengths common in portrait work, this is not as extreme as it sounds.

Other techniques used to reveal character are often aimed at helping the subject to lose self-consciousness. A profile, for example, enables them to look away from the camera, though they might find the result unflattering, as most people rarely see their profiles. Any imperfections of the profile, such as poorly shaped chins or noses, will become very obvious. To avoid this, yet still achieve a different pose, you can ask your subject to look away then look back at you. Using a rapid shutter speed or flash, take the picture when they are not quite facing you, though their eyes are looking at the camera.

For head and shoulders shots where the subject dominates the frame, there is just as much need for careful composition as with full length shots. One consideration is whether or not to frame the shot so that there is space around the edges or so the portrait fits exactly into the confines of the viewfinder. There is justification for both, depending on the effect you want to achieve. There is also a strong case for framing just a selected area—perhaps cropping out the top of the head, for instance.

There is also a need to think about whether or not the main subject should be framed centrally or to one side of the centre. General principles of composition apply just as much to portraiture as to landscape or any other type of photography, so that framing the main subject in accordance with the 'rule of thirds' is often a safe choice. Of course, though this does not have to be observed rigidly and it is a mistake to adhere strongly to a fixed set of rules.

Some portraits aim to flatter the



Photographer unknown. Jenny Baker Collection



shadows, although, of course, it can be very effective to deliberately make a strong shadow part of the portrait.

In your search for an interesting and revealing portrait, it is a good idea to look at those taken by famous portraitists. There is often a clear style associated with each one, and with specific eras. Pictures taken in the first half of the century, for example, tended to be rather stylized and relied on strange or dramatic lighting for their

originality. In the 60s, people became keen on lighting each shot with several lights—main light, fill-in, highlight (or kicklight) and maybe one or two others. This showed that the picture had been taken in a studio with plenty of facilities around. The trend since then has been towards more naturalistic photographs, often completely forsaking the studio in favour of everyday surroundings.

Photographers have tried a wide range of techniques to reveal character.

Grain, blurring, contrast, multiple exposure, double exposure, montaging and practically every other technique can be added to the armoury of lighting and poses to reveal facets of character. It is inevitable that you may repeat ideas used by others, either knowingly or unwittingly, but the vast range of human characteristics makes it possible to treat every subject differently, so that each portrait is as individual as the person it represents.

Colour printing papers

Colour prints have come a long way since the days of carbon tissue prints which called for great processing skill—modern colour papers can give superb results with a minimum of effort

For the majority of people, the final product of their photographic endeavours is a colour print, whether it is a simple commercial enprint or an expensive enlargement. Paper, now usually resin-coated, is still by far the most common printing surface. But there are a number of different emulsion types.

Like colour film, colour printing processes have a long and varied history and most popular modern processes are very different from those of the early years. Of course, the earliest colour prints were simply black and white prints coloured by hand. But even before Maxwell had made the first colour photograph (see page 1914), enthusiastic scientists were trying their hand at producing coloured emulsions. And by the time panchromatic plates for making red, green and blue separation negatives came on the market in 1906, there were a number of alternative processes for producing full colour prints. Indeed, the first successful three-colour print, produced by the American inventor Frederic Ives in 1888, predated three-colour photography by a number of years.

These early processes varied considerably in detail but most depended upon the discovery by Fox Talbot that when gelatin treated with potassium bichromate is exposed to light, it hardens and becomes insoluble. So when a layer of bichromated gelatin was exposed under a negative, the gelatin hardened in proportion to the light. After washing away the unhardened gelatin, an image in relief was left.

With the carbon process used in the 1890s, the gelatin was coated on thin, transparent carbon tissue which could be dyed to any colour. So three coloured carbon tissue reliefs could be made from three separation negatives and stuck together to make a full colour print. The



Pinatype print, 1904 Like many early colour prints, pinatype used selectively hardened gelatin images made from separation negs

Carbro process depended not on the action of light on gelatin but upon the discovery that bichromated gelatin also hardens in contact with silver. So the carbon tissues could simply be held against the normal b & w print and the silver of the image would harden the gelatin in the right areas. The imbibition or dye transfer process introduced as Pinatype in France in 1903 involved using hardened gelatin images from three separation negatives to almost literally print the dyes on to white paper.

Because colour prints involve layers of dye images, they cannot use additive colours (see page 1940)—

though some of the additive screen processes were developed to give additive colour screen prints. So these colour screen prints, like the modern prints, used subtractive colour dyes in yellow, magenta and cyan. Indeed, the convenience of subtractive colour was exploited for prints long before it could be used in films.

All these processes, carbon, Carbro and dye transfer, could give superb richly coloured prints, but were long and elaborate, involving three separation negatives and many processing stages. So when tripack films with three emulsions of different colour sensitivity were developed in the 1930s,

the concept was soon adopted for prints. And now the vast majority of colour prints are made on multilayer emulsion papers.

Modern multilayer colour printing papers are of three main types: those for printing from colour negatives; reversal paper for printing from slides; and dye destruction paper, also for printing from slides.

Prints from negatives

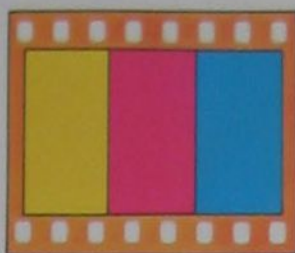
The earliest papers for printing from colour negatives, such as those used in the Kodacolor process of 1942, had the same construction as colour film. The emulsion consisted of three layers, sensitive to blue, green and red. The blue sensitive emulsion was on top, with a yellow filter layer of colloidal silver immediately beneath to absorb blue light which might otherwise affect the red and green sensitive layers. Underneath the yellow filter layer came the green sensitive emulsion and at the bottom was the red layer.

The light sensitive material in all these papers was usually silver bromide (appropriately dye-sensitized) and so the papers could be described as *colour bromide papers*. In each layer, there were also colour couplers to produce the dyes during development.

Just as in film, the cyan dye was formed in the layer nearest to the film base, with the magenta in the middle and the yellow on top. Unfortunately, such an arrangement does not give the sharpest looking image possible. This is because the cyan image contributes much more to the visual impression of sharpness than the yellow. With the cyan layer underneath, therefore, some visual sharpness is lost.

With films, little can be done to solve this problem—the blue sensitive (yellow forming) layer must be on top

Prints from negatives



Unexposed print



Developed print

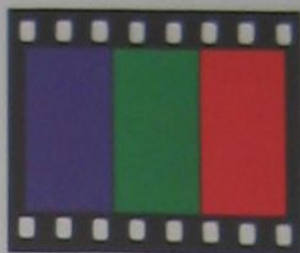


Bleached print



Like colour films, neg-pos papers use colour couplers in the emulsion to form dyes in exposed areas, making a positive print. But the red layer is at the top for extra sharpness

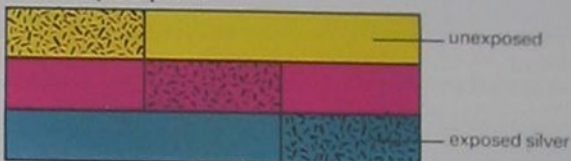
Cibachrome: dye destruction



Unexposed print



Developed print



Bleached print



In dye destruction papers, the dyes are incorporated in the emulsion but during processing these dyes, along with the silver, are bleached out leaving a positive image

so that the yellow filter can be incorporated in the tripack to absorb unwanted blue light during exposure.

However, because printing papers do not have to be as fast as films, the need for the yellow filter can be avoided by using silver chloride as well as bromide in the emulsion. Silver chloride is sensitive to violet rather than blue light, so it can be sensitized with dyes to red or green while remaining relatively insensitive to blue. If the red and green sensitive layers are unaffected by blue light, there is no need for a yellow filter. The red (cyan forming) layer can therefore be put at the top of the emulsion layering, to help give a considerably sharper image.

Dye destruction

As in most colour processes, the dyes for colour print paper for printing from negatives are formed during processing. But this is not the only possibility. The Cibachrome process, which is by far the most popular method for making prints from slides, works by starting with all the dyes present and then destroying those not wanted to form the image.

The principle of dye destruction was suggested in the 19th century by Karl Schinzel, but early prototypes were not successful. In the early 30s, Dr Bela Gaspar produced his Gasparcolor process which depended on the destruction of dyes in proportion to exposure. It was never as successful as it

could have been, though the movie film version was popular. But it formed the basis for the Cibachrome process.

In manufacture, each of the three layers of Cibachrome is filled with the appropriate coloured dye. Because of the uniform dye layers, it has a dark grey-brown appearance. And as the top blue sensitive layer is coloured yellow, there is no need for a yellow filter layer.

When the paper is exposed to the slide and developed, a black and white negative image is formed by the silver in each emulsion layer. But in the next processing stage, the specially designed bleach works on not only the silver but also the dye wherever there is silver—

that is, precisely where the dye is not wanted. After fixing and washing, the result is a positive dye print.

Although it is slow (because the dyes reduce the light reaching the silver bromide), Cibachrome is very simple to process and gives extremely good colour. The reason for this is that the manufacturers can work with the whole range of azo dyes. With normal, chromogenic emulsions, on the other hand, only dyes that can be formed with colour couplers can be used. This not only reduces the chances of getting a dye of precisely the right colour but also means that slightly less light-fast dyes must be used. So conventional prints fade much sooner than Cibachrome prints.



Improve your technique

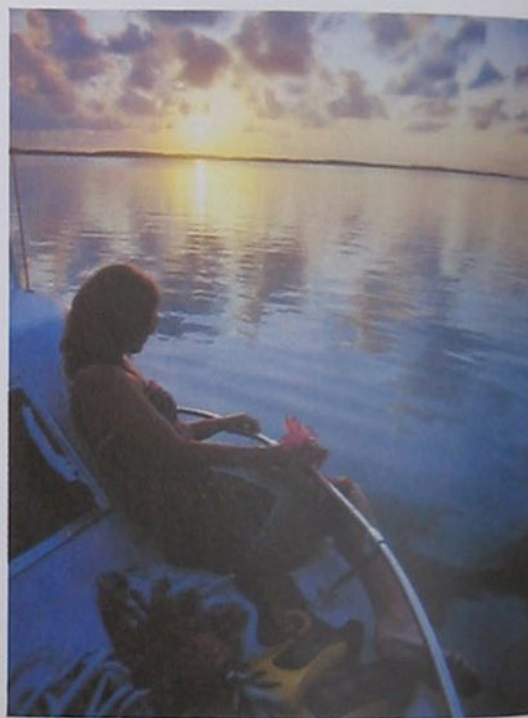
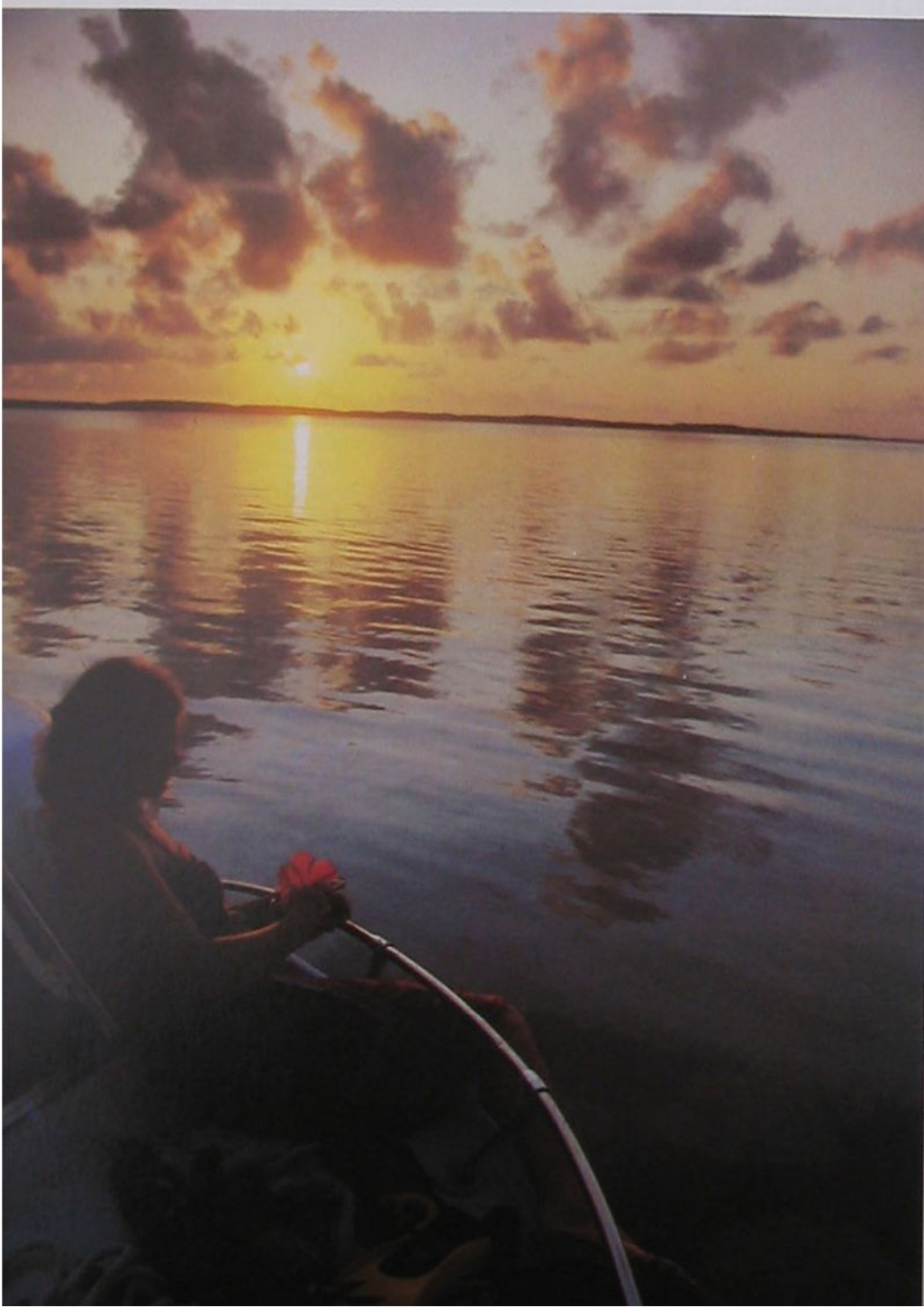
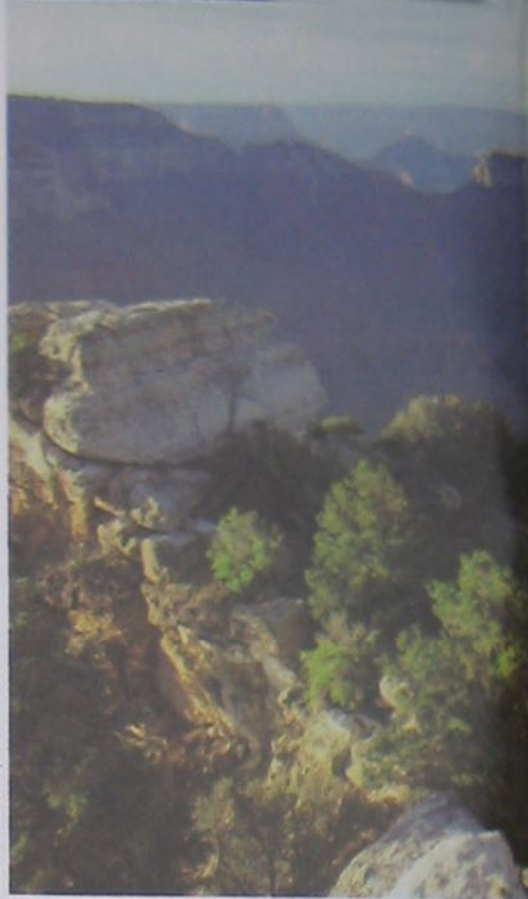
Filter tips

You can cope with most situations with just a small group of filters. But to get the best out of them it is essential to know when, and when not, to filter

Most photographers have some idea of how filters work and the effects they produce. But it is sometimes difficult to know exactly when to use them. It is tempting to think that you need a large stack of filters so that you can handle every conceivable situation. But if you look through the articles in which filters are mentioned you will find that the same small group crop up time after time. So it is worth taking another look at these filters and relating them to the weather and lighting conditions you are most likely to encounter.

There are occasions when, although a filter might appear to be needed, it actually has very little effect. The most common example is haze which is supposed to be reduced by UV and skylight filters. In fact, with modern lenses, the glasses used to make the elements absorb so much UV that a filter is of no additional benefit. Cameras with extremely simple lenses, such as old folding types, and those with plastic elements (such as Polaroid models) may benefit slightly, but the main use for UV filters is for lens protection.

Richard & Sally Greenhill

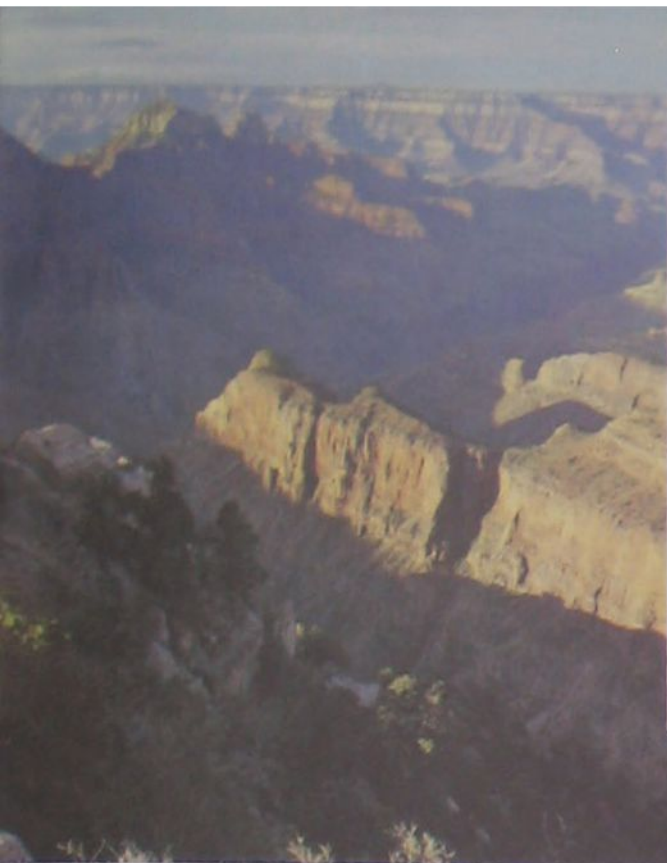


Cooler sun *Sunsets are sometimes too red (above). You can easily rectify this by using an 82A filter, which cools the colour without ruining the atmosphere*

If you shoot in black and white, yellow, orange and red filters cut down haze a little. For colour work, polarizers have a similarly small, but noticeable effect, though the extent to which a polarizer reduces haze depends very much on the lighting conditions. The maximum effect is obtained when the sun is at 90° to the line of view.

More often than not there is little you can do about reducing haze. And sometimes the haziness itself is not a problem, though its colour might be. Both haze and

Michael Joseph



Canyon haze You can sometimes use a polarizing filter to cut down haze, depending on weather conditions and the position of the sun. In the shots above, the sun was at approximately 90° to the photographer's line of view. Using a polarizer (left) makes distant detail much clearer than in a shot without one



Lawrence Lawry



Water glare This kind of overall glare (right) is common in overcast conditions, but is very effectively reduced using a polarizer (left)

Bright sky In bright but overcast conditions the sky records as a boring, burnt out white (right). This is rectified using a graduated filter (above right)



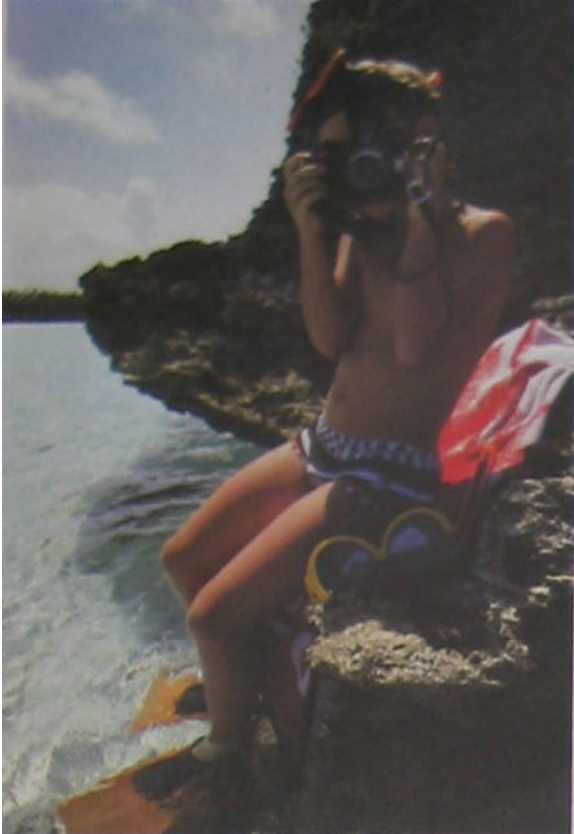
mist tend to photograph very blue. Occasionally this blueness can be attractive, but it is usually better to warm up the scene using an 81 series filter. An 81B is usually sufficient—anything stronger over-compensates and the result is an orange picture. Judging the amount of filtration needed is not easy, but generally the thicker the mist, the more filtration is needed, particularly if there is cloud as well.

Cloud on its own can also be difficult to filter for. Low, dense cloud makes the

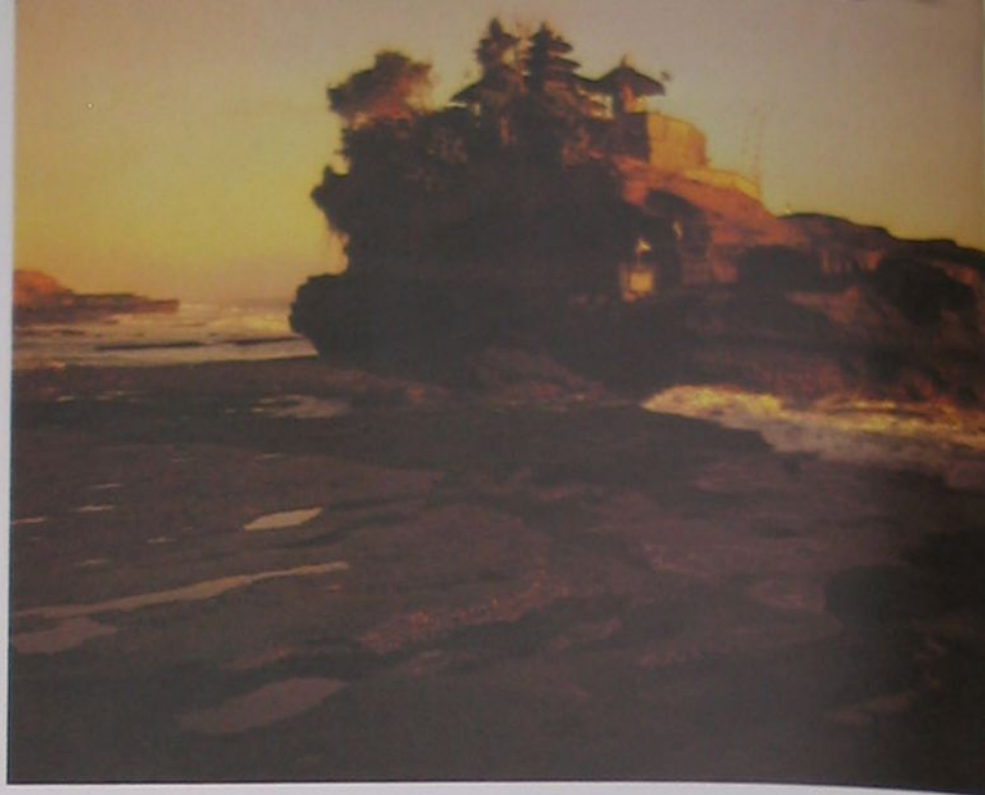
light very blue, so an 81B filter is required. But you should not automatically use a filter whenever there is cloud. High, thin cloud—the type that gives overcast but very bright skies—has little effect on the colour of the light, and an 81 filter would give very orange results. It is better not to use a colour correction filter at all in these conditions.

The filter that is useful with bright overcast skies is a graduated type. This type of sky tends to come out as a bland white in pictures. A grey graduated filter

Bob Croxford



Vautier/de Nanxé



When to warm Many people use an 81 series filter only when it is cloudy. But even when it is sunny you may find that the picture is too 'cold'. This is particularly noticeable when the subject is in shade (left) or if there is a lot of sky and water in the shot (right). It is a good idea to use an 81 in these conditions, especially for skin tones (above left). You may even like to try using slight over-filtration for effect (above right). A warm filter is also useful in mist. Unlike haze you cannot reduce the mist, so it is simply a case of making it an acceptable colour. With the shots below neither is 'correct' but the warmer colour seems more suitable



Michael Joseph



slight blue cast which is particularly noticeable on skin tones. Once again, an 81 series filter solves the problem, and if the main part of your subject is a person then slight over-filtration does not matter, but will simply give slightly richer skin tones.

For a similar reason the same filter is often used with flash. Reciprocity law failure causes flash pictures to be slightly blue. An 81 filter gives much better skin tones but can be slightly too warm for other subjects.

Similarly subtle effects can be

helps to give a more reasonable tone, while a blue one adds colour as well, giving a fairly natural result. Other colours can be used if a natural effect is not essential (a subsequent article covers this use of these filters).

Surprisingly, pictures taken in clear, sunny weather can also need filtering. If your subject is in shade then it will be lit just by blue sky. This usually results in a



Graeme Harris





Vautier/de Nanxé



John Sims

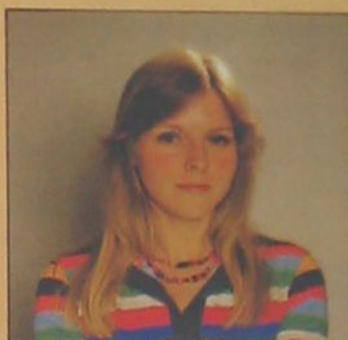


Strong and subtle
UV filters have no visible effect on haze. The two parts of the shot above were taken with and without a filter, and there is no difference between them. In the shots of the dancer, flash was used for the main lighting. This gave a cold, stark result (left), so a yellow filter was used to simulate the original candle lighting. In the shots below, a pale magenta filter (right) has been used to remove a green cast caused by light reflecting from the foliage near the subject

obtained with other colour filters. For example, if you have a model standing near some green foliage, he or she might well pick up a green cast due to light reflected from the leaves. A pale magenta filter corrects this. Alternatively, you might want to increase the colour saturations of your subject. Food photographers often use pale red filters to make meat look juicier. Using a pale filter of the same colour as your main subject helps to make it stand out, especially if the surroundings are of a different colour

Warming the flash

Using flash without a filter tends to give results which look 'cold' (bottom right). A 10Y yellow filter (below) corrects the blueness to give more natural colours. But if you want slightly richer and warmer flesh tones, it is a good idea to use an 81A filter rather than the yellow



Peter Lake



Using an airbrush

An airbrush is a tremendously useful retouching aid, as well as a highly creative tool in its own right, which can be used to add or change detail or areas of tone on your prints

An airbrush is a very small, fine and precise spray gun, the size of a heavy pen, which you can use to apply areas of tone or colour to a print to eliminate compositional mistakes or to change the colour or tone density of certain areas.

Compressed air from either a sealed can or, alternatively, from a motor powered compressor, propels liquid through the airbrush nozzle to project a fine spray rather like a conventional spray gun. The difference between a spray gun and an airbrush, however, is that the nature of the spray from the airbrush can be finely controlled. By adjusting the air pressure, the paint supply and method of application you can use an airbrush to accurately colour-match existing print colours, and perfectly retouch any image. The spray can be a heavy 'spatter' or a fine mist over a wide or narrow area.

You will often need a conventional brush to retouch small details, such as hairlines and spots, but by using the airbrush corrections to large areas of the print can be almost invisible—but, it must be said, only with considerable

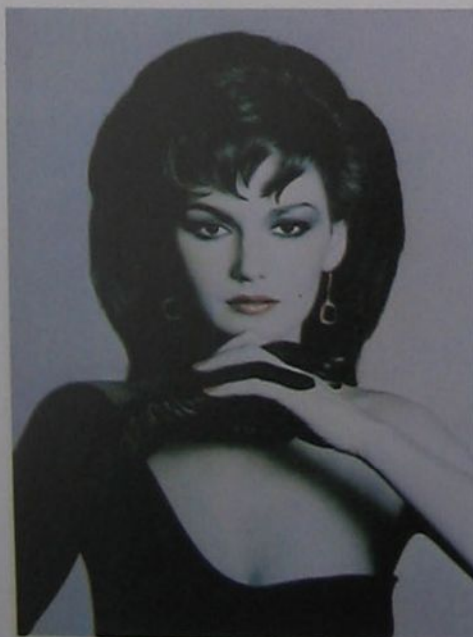
practice. Always have several copies of your chosen print available for practice and experimentation: mistakes and miscalculations frequently occur.

The main photographic use of an airbrush is to improve the evenness of tone of an image, or to bring up one tone in relation to another. It is also used for covering up any blemishes which may be due to faulty or dirty negatives, uneven development (of print or neg.) or poor enlarging equipment. Haze can be introduced into areas of the print to 'distance' sharp backgrounds.

An airbrush is very effective for introducing or emphasizing highlights and shadows to tidy up and brighten an image. These can be often outside the density range of the print, and skilfully employed can give the picture a super-real quality.

Special effects, such as the invisible joining of images on multiple prints or removing backgrounds, are easily accomplished with an airbrush. You can create false information such as the addition of clouds with practice. And you can add colour to black and white prints: in extreme cases, you can even rework an image or a subject which is unsharp, too flat, or lacking in impact and detail. Advertising still life photographs, are

Adding colour Two black and white images subtly and delicately retouched in colour with an airbrush



James Wedge



Art and photography Using an airbrush on photographic originals makes it possible to create surrealistic images such as this





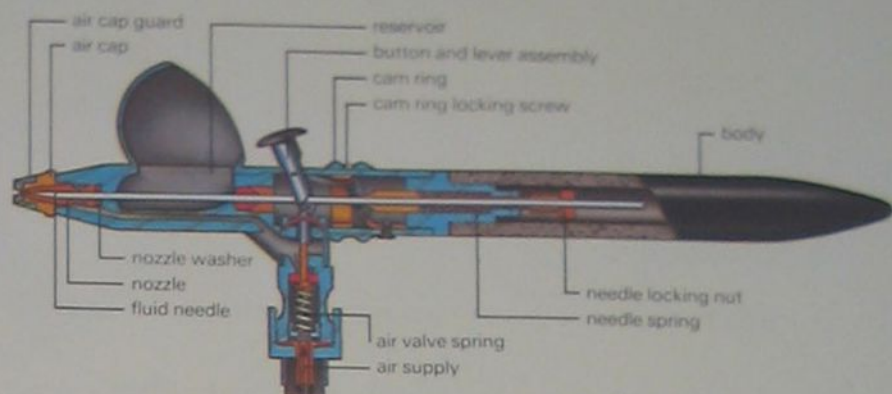
Bob Carlos Clarke

Detail removal The presence of the TV aerial detracts from the old world charm of this building—but is easily airbrushed out



c Marshall Cavendish

Airbrush construction



Airbrush operation

An airbrush is similar in appearance to a fat fountain pen, but in place of the nib there is a nozzle-set through which a fine spray of colour or tone is propelled by compressed air.

Behind the spray nozzle is a small recessed reservoir for the colour, and behind that the control button. Directly below the control button, which points upwards, is the connection for the compressed air lead, on a screw thread.

The control button controls both the air valve (and hence the air pressure), and the position of the needle, which runs right through the airbrush, ending in an extremely fine point which rests in the nozzle. The exact fitting of the needle and its nozzle, the 'nozzle-set', controls the spray.

The needle passes through the colour reservoir then to the nozzle. The air valve below the button and nozzle-set normally remains closed when the brush is not in use.

You should hold the airbrush lightly in your hand, like a pencil, positioning the control button so the tip of your forefinger rests over it. Your second or third finger should rest against the air lead below, helping to steady the airbrush and keep it upright.

Angle the airbrush at 45° to the surface of your print when working normally, and pass the airlead over the back of your hand and away from the work.

With the airbrush receiving air at the correct pressure, and with colour in the reservoir, gently press down on the button to activate the flow of compressed air through the air cap, at the tip of the airbrush, which surrounds and protects the nozzle-set. No colour emerges from the airbrush until you begin to draw back the button towards your wrist.

The passage of air in the air cap forms a slight vacuum at the tip of the nozzle set, and as you draw back the needle, the colour is sucked from the tip, and atomized into a fine spray.

The further you draw back the button, the greater the flow of colour. When you have finished the work, let

the button run forward to cut off the flow of colour, before you release the downward (air supply) pressure. If you do not follow this procedure, liquid colour will be left on the needle tip and will escape as a blot or blob when you next start work.

It is essential to keep the same downward pressure on the button throughout. If the air supply is not maintained at a constant pressure, the texture of spray tone will be uneven. As the pressure drops the texture becomes coarser. If you set the air pressure correctly, you should be able to balance exactly the grain and texture of the original.

To repeat work of a particular colour density you can set the colour flow at a constant rate by setting the cam ring, which is situated behind the control button. Undo the cam ring locking screw then turn the ring clockwise to draw the needle away from its nozzle. Lock the ring when you have reached the required volume. With this method a set amount of colour is released just by pressing down on the button, but you can still release more colour by pulling back the button further.

You need a constant supply of compressed air to operate the airbrush. This air must be clean, free from dust and grit, and free from oil or water vapour.

Small electric compressors, with reservoir, valve and air filters are now quite cheap, but tins of 'liquid' air are becoming increasingly popular.

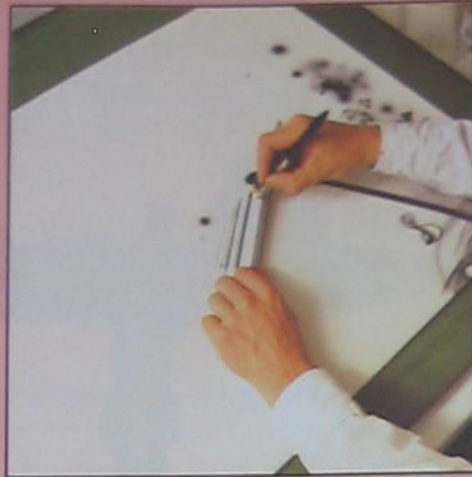
Common spray faults

- Airbrush texture too coarse: increase the air pressure.
- Uneven broken-line spray: the pigment is probably too coarse. Remix the colour and wash out the airbrush.
- Spray heavier one side than another: there is a blockage in the air cap.
- Colour leaking from nozzle with the needle closed: colour has dried in the nozzle, remove it and soak it in solvent.
- Colour splatter or spitting: failure to depress the button first to release the air.

Retouching with an airbrush



1 Basic airbrushing equipment consists of: airbrush, compressed air, suitable inks, masking tape and film, and mixing, cutting and cleaning utensils



2 Always practise brushing techniques beforehand to ensure everything is in correct working order. Practise, too, the brushing strokes you will be using



3 Some form of masking is nearly always needed to protect parts of the image from spray. Cut masks large enough to cover the print and its mount



7 When the previous application has dried, you can spray on the base coat in a tone which matches the rest of the print. This acts as the base for fine detail



8 Add fine detail gradually, allowing each coat to dry before applying the next. Practise on unwanted prints until you are sure of your technique and the effect



9 When the final coat has dried, carefully peel back the masking film and discard it. Remove the print from its backing if a temporary mount has been used

often completely retouched in this way. 'Cut-aways', such as the insides of car engines, are combinations of pure photographs and airbrush retouching.

Preparations

It is important to see well when airbrushing, so work in good light. Use a bright striplight, or an adjustable lamp balanced for colour work. It is best to sit on a high stool and tilt the print towards you on a board.

Apart from the airbrush and colour mixing equipment (see below), you will need card or proprietary materials for masking, masking tape, a scalpel, and a magnifying glass for fine work. Most art shops now have special sections which deal only with airbrush accessories. You will also need cotton wool buds, and sable brushes Nos. 1, 2 and 3 for spotting and finishing off fine detail.

All prints must be taped flat or dry or spray-mounted before airbrushing on a hard, flat surface. Grease marks on prints, particularly fingermarks, will show up as definite textures under airbrush detail so, after mounting, clean

your print with a weak solution of ammonia to degrease it.

Using an airbrush

Before you start work on any print, thoroughly familiarize yourself with the operation of the brush (see panel) and practise getting the effects you want on pieces of blank card.

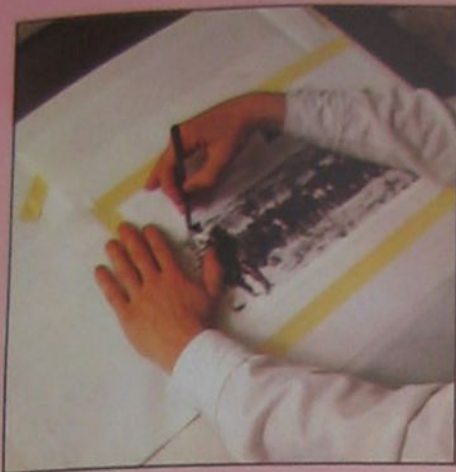
The spray liquid in the reservoir is always called *colour* whether it is intended for black and white retouching, or coloured for colour work. You can use black or white paint, water based artists colours, oil colours, and spirit dyes—indeed anything thin enough to be sprayed easily. But the colour must be free from any grit that may block the nozzle-set of the brush. Avoid colours which dry and cake easily, these clog the airbrush. It is best to buy tubes of specially manufactured airbrush colours which are easy to dilute to the correct consistency with clean water. Remember to replace tops of tubes or pots immediately after use.

Connect the flexible lead first to the air supply, then turn on the supply to blow

out any dust in the hose. Then attach the lead to your airbrush. You need to set the air pressure differently depending on the type of colour you use. Follow the manufacturer's instructions for any particular type of colour. In general, spirit colours need less pressure than oil-based or *gouache* (thick, opaque water colour) paints. There is no advantage in setting the pressure too high, and too much air will dislodge stencil films, if you use them on the work.

Mix gouache colour on a clean palette using a round hoghair brush (No. 5 or 6). Use turpentine to dilute oil colours, or clean water for water colours. You need only dilute the colour sufficiently to allow it to flow evenly in the airbrush—it should just drip off the loading brush. You can spray delicate tints from a full strength colour in the reservoir by adjusting the nozzle for a very fine spray.

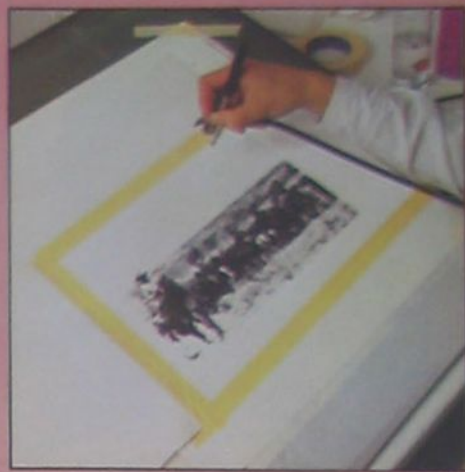
To obtain detail on the photograph, you must first use a *body colour*, a mix of white and the colour in use. To change the colour of the image, spray only with a pure colour mix. Holding the airbrush at the correct angle as recommended by



4 With a new scalpel blade, cut through the mask—but be careful not to damage the print below. Cut into areas of dark detail to avoid a 'halo' effect



5 Carefully peel back the mask film from the area to be worked. This can be discarded or reapplied for subsequent work in other areas of the image



6 If, as here, you are removing detail from a photograph, begin by spraying suitable opaque over it to match the colour of the surrounding area



10 Some retouching with a brush may still be necessary—particularly if you wish to add fine detail which is beyond the scope of an airbrush

the manufacturer, load the airbrush by wiping the hoghair brush downwards into the reservoir, until two-thirds full.

Operate the control button as described in the panel, and practise making strokes on a sheet of scrap paper, stopping the colour flow only at the end of each stroke, while keeping the button depressed to continue the release of air. Always move the nozzle of the brush smoothly and parallel to the surface to give an even distribution of colour—simply swinging the brush from side to side gives an even spray tapering out at either end of the swing.

To build up tints, overlap each stroke by half so that the coverage is even. For solid colour application the airbrush should be about ten centimetres from the work. The airbrush sprays out a cone of colour, and the nearer you work to the print the sharper the spray line will become. Practice will make this obvious.

You can use the airbrush for fine line work. Adjust the nozzle to a fine jet and spray the work, at a suitable angle, allowing the air to escape freely over and across the paper surface.



Chopped chopper The helicopter in this shot (above) spoils the authentic 'ranching' feel which is presented quite effectively in the rest of the photograph, and the sky is rather flat and featureless. Below, the same shot with the helicopter airbrushed out and detail added to the sky to strengthen the image





Montage Air-brushing is used extensively in advertising to create 'impossible' images which may or may not stem from single images. Here, three originals were combined in stages to give the image at left. This was then airbrushed to add and tidy detail



Always be sparing in your use of colour because if you release too much, you may flood the work with liquid colour, and splatter it in all directions. Build up colour by repeated applications rather than in one heavy coat. To spray a graduated tint, start close to the work with a dense band of colour and pull the brush back, working away from it. Raise the airbrush at each stroke and as you work move away from the dense edge. In this way you can build up a tint which changes in density from dark to light yet shows no hard lines in the transition.

Stencils and masks

In order to stop colour spreading to areas where it is not wanted you will nearly always need to mask your photograph as you airbrush it. Even the most experienced worker, when spraying fine details and retouching close to the print, uses masks to keep the rest of the image clean, and clear of colour drift.

The simplest masks involve taping down strips of thin card with removable masking tape that does not leave a sticky mark on the print. You can use masks for sharp or unsharp masking. Card which is

flat on the print will result in a sharp edge, but if you hold the card away from the surface of the print, the result will be a soft edge known as unsharp masking.

The most advanced masking technique involves using a special transparent, slightly adhesive film, which is protected by a backing paper, readily available from art shops. Cut a sheet of the film to the full image size and peel off the backing paper and then carefully place the tacky film down on to the image, expelling air bubbles. Using a scalpel with a new blade, carefully score the film, but not the print, along the required image outline. Peel away the film from the image area on to which you intend to spray, then complete your airbrushing. The advantage of this type of masking is that you can replace the cut away film to protect your first area should you wish to colour the rest of the image differently. Be very careful to avoid stretching the film when peeling it from the print. Again this technique needs practice.

Preserving an airbrushed image

Airbrushed images are very delicate and are easily smudged or damaged with rough treatment. Indeed, if your results are unsatisfactory, you can remove all the airbrush work (except colour-dye work) by washing it off quickly with cotton wool soaked in a suitable solvent.

To preserve a particular effect, copy your result on to a suitable film type using your camera or enlarger. Or you can protect a finished print by filling the airbrush with a solution of clear gum arabic and evenly spraying the whole print. Alternatively, use a proprietary matt or gloss print spray, which also includes an ultraviolet fade-resistant coating. Spraying the print also helps to make airbrushed areas indistinguishable from original print areas, as it unifies the surface texture. Like all valuable photographs, you should protect an airbrushed print with a sheet of clean paper or tissue.

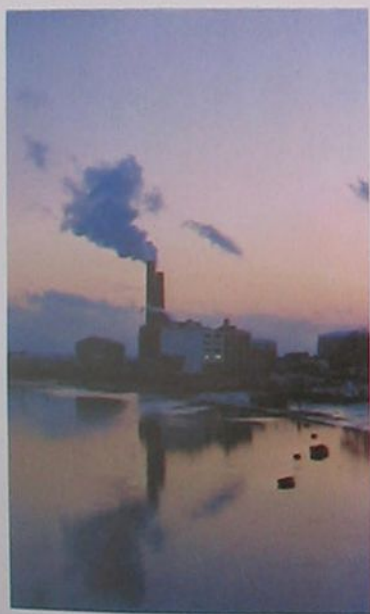
What went wrong?

City at dusk

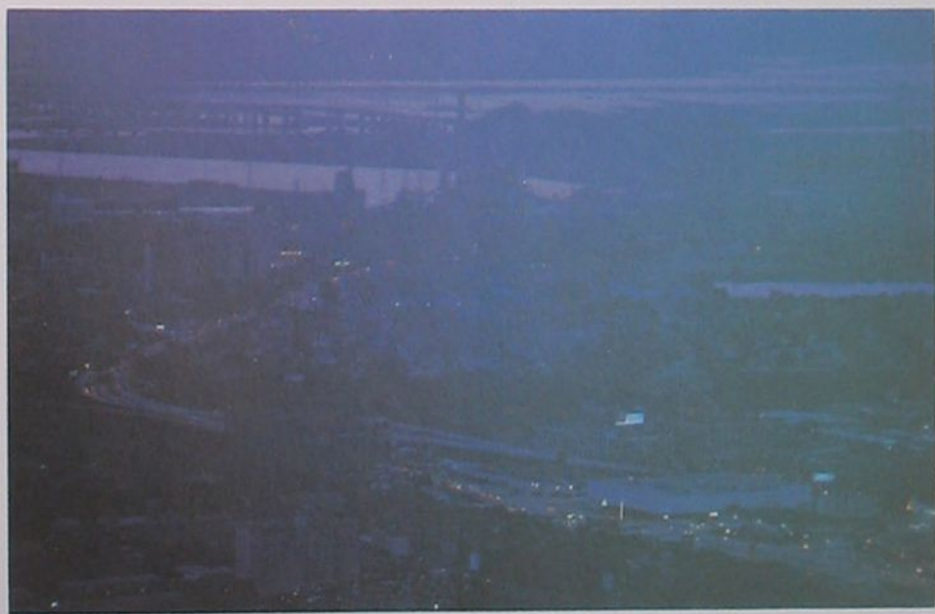
Twilight pictures often appeal because of their strong colours. But as Sergio Dorantes points out, you should still pay attention to detail



An ordinary scene which includes artificial light sources can make an interesting picture with intelligent use of a starburst filter. Despite this, I think that this picture fails to make a successful image. There are a few reasons why this happened. Exposures at dusk can be particularly critical, and this picture shows overexposure which spoils the delicate light balance. Another reason for the failure of the picture is the flare around the light sources, caused by the filter. This has added to the overexposure, leaving the image with little appeal to the viewer. I would have overcome these problems by taking a careful incident lightmeter reading, placing the camera on a tripod or a solid support, and setting the lens diaphragm to a small aperture to increase the depth of field and thus diminish the flare caused by the filter



The colour shades and nuances recorded on the film have produced an evocative and emotional picture. However, some points were overlooked when this picture was taken. The sky's colour is washed out spoiling the effect. Furthermore, the composition is not balanced. A very important element of the composition is the reflection of the billowing smoke, and it has partially been excluded from the picture. I would have included the whole reflection of the cloud of smoke and given prominence to the foreground



Scenes at dusk can be magically transformed by the quality of the light. Often the photographer is overwhelmed by the colour and the light, rather than by the scene. This happens here. There is no organization to this picture and the pattern formed by the city lights is not strong enough to produce a picture with impact. The area at the top of the picture is empty of detail and does not add interest to the image. Exposure should be more generous to reveal more detail on which the eye could focus. If I had to take a photograph of this scene, I would have tried to compose it more tightly, using a longer lens and concentrating on one part of the scene rather than the whole.

If I were forced to use the same focal length, I would have given a longer exposure to get the lights of the moving traffic to paint lines of colour, thus giving more interest to the picture. I would have also tried taking a different approach to the same scene, such as moving the camera during exposure, or using a diffraction filter or a prism, all in order to give a more imaginative presentation of a dull scene.

The photograph was taken from the top of New York's World Trade Center





Creative approach

Autumn

Autumn brings much more than its immediately obvious flashes of bright colour—its muted tones and soft light should not be overlooked. Incorporate the elements of contrast in colour, shape and scale for more interesting shots

Each season has its own appeal to photographers, but of all the various times of the year, autumn is perhaps underestimated more than any other. It is all too easy simply to concentrate on the obvious bright colours of the season and in so doing miss many other features—the more muted shades of the softer light, the tiny details of nuts and berries and the general 'tidying-up' activities of this time of the year.

The most obvious feature of autumn is the dramatic change that takes place as trees turn colour and begin to shed their leaves. But another characteristic of the season that is more important to photographers concerns the change that takes place with the light itself.

Two qualities of autumn light have a great influence on the photographs that can be taken. The lower angle at which the sun shines means that the oblique

Small scale Without the area of bright orange of the toadstool, this shot would have lacked impact. The green shoots add considerable contrast



rays of light bring out subtle shapes and textures more distinctly—even during the middle of the day. Secondly, the soft, misty days that are frequent in autumn give a mysterious, almost unreal quality to a scene.

In the misty, diffused light, all colours are pale and muted—so much so that often colour pictures end up having more of a monochrome quality. Since distant outlines become so indistinct, to make a shot like this effective, you may need to frame it to include stronger shapes in the foreground or middle-ground. Silhouettes of people looming out of the mist or a figure standing on a small footbridge are the kind of subjects that suit this light. Any city park or street, village square or rural landscape can be transformed from something relatively mundane to a scene of mysterious beauty simply by exploiting the characteristics

Large scale The red tree in the foreground adds contrast to what would otherwise have been a fairly ordinary scene—the same effect as the shot above

Stephen J. Kraseman/DRK Photo



Creative approach

of the prevailing sunlight.

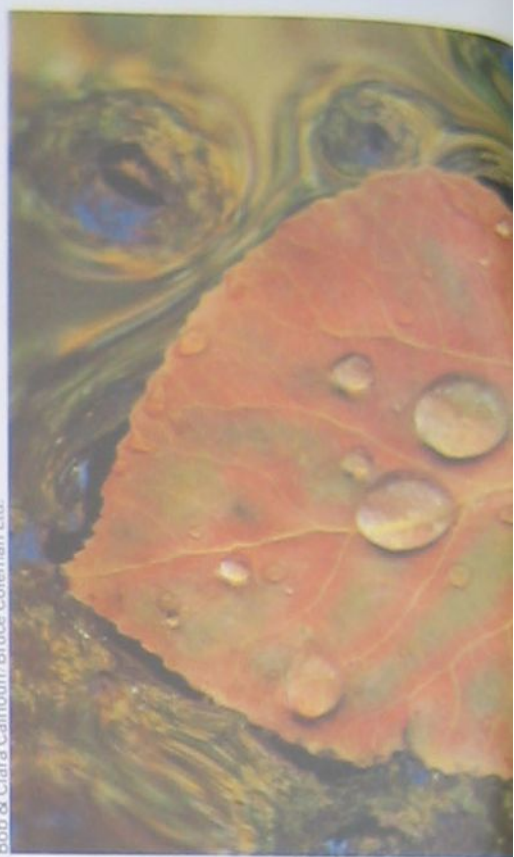
This time of year is ideal for landscape photography. Not only does the low angle of the light pick out every rut in a ploughed field and every tuft of heather in a stretch of moorland, but also you will find a wider range of colours and tones than at any other time of year. Areas of landscape that appear as monotonous stretches of green earlier in the year become interspersed with patches of brown, yellow and gold. The dramatic colours of dawn or sunset also occur at more accessible hours of the day and can be used to enhance a landscape.

The glorious colours of the dying leaves make immediately attractive subjects for the photographer, but, all too often, results are disappointing. There is a limit to the impact that can be achieved

by concentrating on such a well worn subject and it is worth trying to find a way of treating it in a more original way.

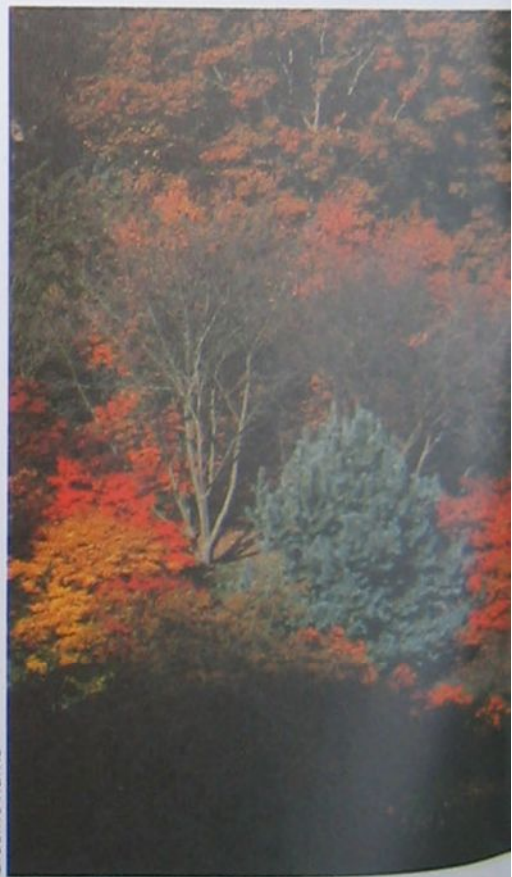
At close range there is plenty of scope for detailed shots of leaves as well as branches and the colour and texture of tree bark. Red leaves backlit against a blue sky can make attractive compositions, especially when framed to create a pattern. Try using a polarizer to make the most of the colours.

Another worthwhile approach is to use a telephoto lens to frame several tree trunk sections together with a few branches hanging between—this can be particularly effective with the delicately contrasting silvery bark of silver birches. For added impact, look for a forest floor of red or gold ferns or low lying mist. Shots at close range can also



Forest floor The use of a wide angle lens helps put the element of interest—fallen leaves—in a prominent position in the foreground of the picture, yet are clearly within their overall context

Patchwork quilt Evergreens provide blocks of strong contrast with the other patches of autumn colour, giving an interesting patchwork effect



Bob & Clara Calhoun/Bruce Coleman Ltd.

Graeme Harris



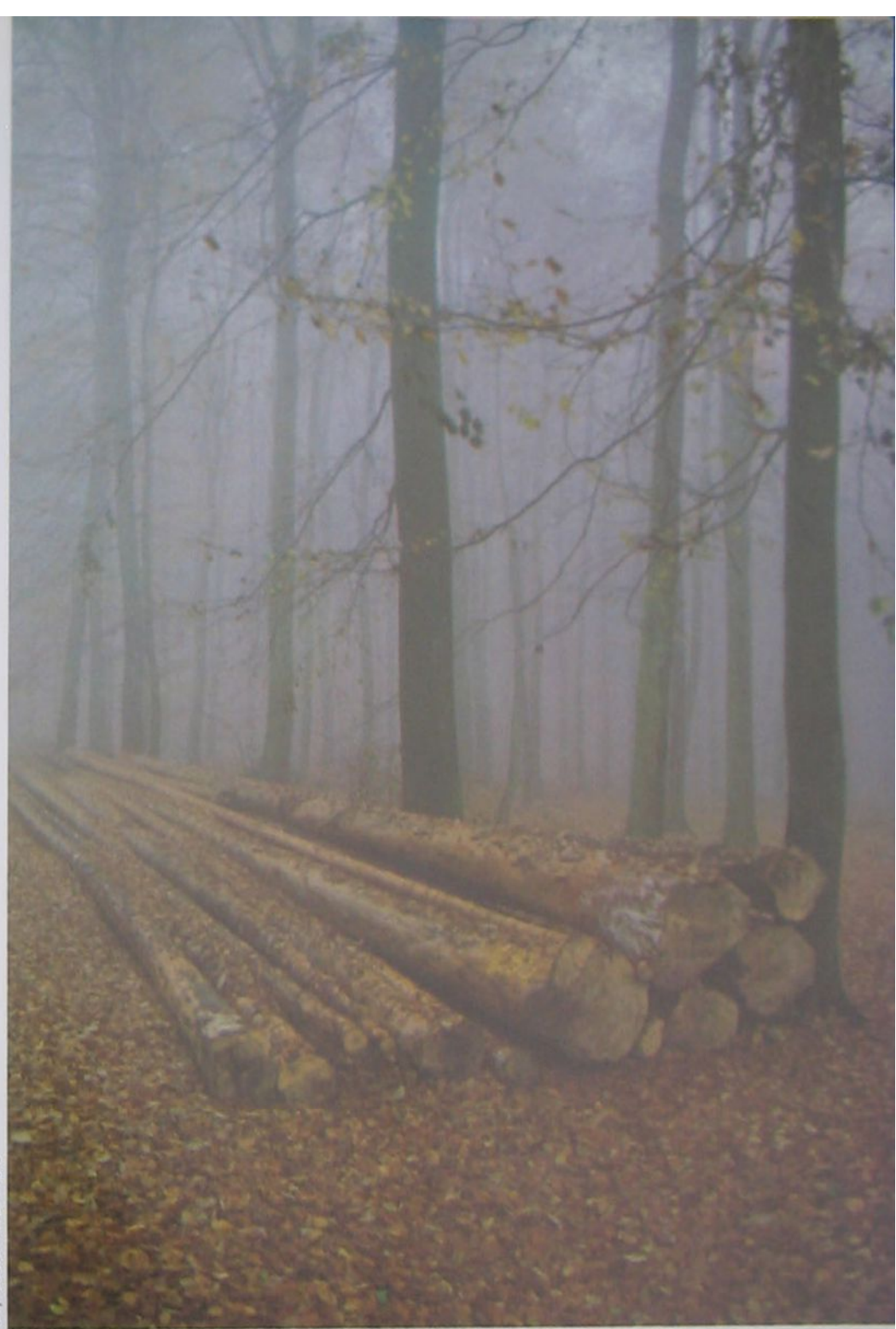
Solo leaf Water drops add an atmospheric element, reminiscent of foggy autumn mornings. Such details can easily be set up by the photographer. An interesting background is also important

Autumn elements The lack of bright colours, the brown leaves, the mist and the recently felled trees all add strong clues to the time of year



Guy Usclat/Atlas Photo

John Sims



reveal details that few people usually notice—perhaps a single leaf that has already turned colour, surrounded by a mass of trees or an obstinate leaf clinging to a branch, backlit to reveal its full colour.

At the opposite extreme long shots of trees also offer the chance to create unusual photographs. By using a long telephoto you can close in on a distant wood—perhaps a stretch of evergreens with the odd clump of silver birch or beech trees dotted amongst them. In less wooded areas, look out for groups of trees resplendent in their autumn colours which stand out from their surroundings. In mountain and hill country, wide angle views are improved by the inclusion of a solitary tree—perhaps a

mountain ash bedecked with red berries.

While close-up and distant shots of trees in their autumn colours are often successful, middle distance shots can be disappointing unless you think carefully about your approach. Try to do something a little different. Rather than framing a single tree, include a whole row and wait for a few people to wander past to give the shot a focal point. Alternatively, with a wide angle lens, —the wider the better—you could focus on dead leaves on the ground, stopping down to the smallest aperture possible to include a tree or group of trees in the background. A similar technique can be tried with a horse chestnut lying in the grass and children playing 'conkers' in the background.



Graphic effect Blocks of strong colour can be made to work against one another. An added point of interest for this shot is its viewpoint from underneath the tree

Vertical view A very wide angle lens adds impact to the classic colour contrast of orange and blue. The photographer has also chosen to shoot into the sun



An advantage of the low angle of the autumn sun is that in woods and forests it is quite common to see shafts of light filtering through the leaves and branches of the trees. These rays show up best on misty days or when there is a little smoke hanging in the air. These rays add beauty to a woodland scene, but try walking around to find an angle which shows them up best—usually in line with them, shooting straight into the light from a low viewpoint. Frame the shot so that a branch or tree trunk hides the direct view of the sun and use a piece of cardboard to shade out extraneous light.

When photographing colourful trees near a stretch of water—perhaps a slow moving river—look for reflections on the water. Often brightly coloured trees can make water appear a bright golden colour—the feeling of autumn can be reinforced further by including a few dead leaves floating in the foreground—if there are none there, throw some on the water yourself.

In a city, autumn trees frequently look even more impressive than they do in the countryside, simply because there are so many more elements that can be included in a photograph. The red, orange and golden leaves of the trees in a city park can be combined with monolithic city blocks towering in the background. Alternatively try shooting a wide view of a city park surrounded by busy streets from the top of a tall building. Or frame a cityscape through the defocused branches of a tree in full autumn colour.

Close-ups of fallen leaves on wet sidewalks and roads, patterns made by leaves floating in ponds or lakes also make good subjects. Even the most modest back garden can be full of subjects that are highly photogenic when isolated with a close-up lens—perhaps a dead sunflower surrounded by withered leaves. Generally, contrasting darker backgrounds work better for brightly coloured leaves. Also, to ensure that the whole picture area is in focus, position the camera in the same plane as the subject and use the smallest aperture you can. On windy days, leaves actually falling from the trees can also be used to create a more unusual view of the season. Experiment with slow shutter speeds to render the falling leaves a mass of blur or try using fast shutter speeds or flash to freeze them in mid-air.

When concentrating upon rich colours and textural details, slow transparency film is usually the best choice. But for other autumn photographs you may find it effective to go completely the other way—exploiting the coarse grain of high speed transparency film such as Ektachrome 400. Low contrast, grainy film can be ideal for conveying the mood of a misty autumn day and you may find it worthwhile experimenting with similar techniques—perhaps soft focus filters or texture screens.

One of the most stimulating features of this time is dewy, autumn dawn. It is well



Anne Martens/The Image Bank

worth making the effort to go outdoors at this time. You can photograph magnificent moody landscapes with low lying mist and outlines of trees poking out at irregular intervals. But this is also a time for excellent close-up opportunities—a bush laden with dewy webs or an early frost glistening on a dead leaf.

Whether shooting in the city or in the country, distant landscapes or intricate close-ups, the season of autumn offers a multitude of subjects. However, to

convey the full mood of the season, do not restrict yourself to just the colours of the leaves. The advent of cold, damp weather makes its mark everywhere—from the gloomy faces of commuters to the heavy tread of schoolchildren reluctantly starting back to school. By looking for more subtle aspects that signify this time of change, you are more likely to produce original photographs that will sum up the feelings that people experience as the warm weather fades.

Canalside Use of a telephoto lens emphasizes the slightly foggy atmosphere. The small area of leaves in the top right hand corner gives another seasonal clue

Shafts of sunlight To take such a classic view it is often necessary to shoot directly into the sun, or mist may not show

Old fashioned look The grainy effect of a fast film can lend a rather appealing autochrome look to pictures



Brian Woods



Venice

Can an amateur take original photographs in one of the most photographed cities in the world? Dedication and careful planning paid off for office worker Michael Brooks

Michael Brooks is an amateur photographer, with no formal training in the subject at all. He has learned photography purely through studying the work of others, mostly in *The Photo*, noting their approach to different subjects. So when he spent a week in Venice, he dedicated himself to photographing the city as a professional would. It was an opportunity to put into practice all the advice and methods he had absorbed over the previous 18 months that he had been a keen photographer.

Interestingly, Michael found that the assignment taught him a great deal about light itself. 'I learnt about the necessity of keeping an eye on its changing character—and the value of rising early or waiting for the most favourable light,' he said. 'I planned shots days in advance,

Blue canal 'I had seen a piece of blue and white Delft china that looked like this while wandering round, and saw the location that afternoon. I bought a blue 80B filter there and then, and went back at dawn. I used the standard 50 mm lens and the tripod.' The filter also corrected the light of the tungsten lamp, making it white instead of yellow on daylight type colour slide film



Michael Brooks



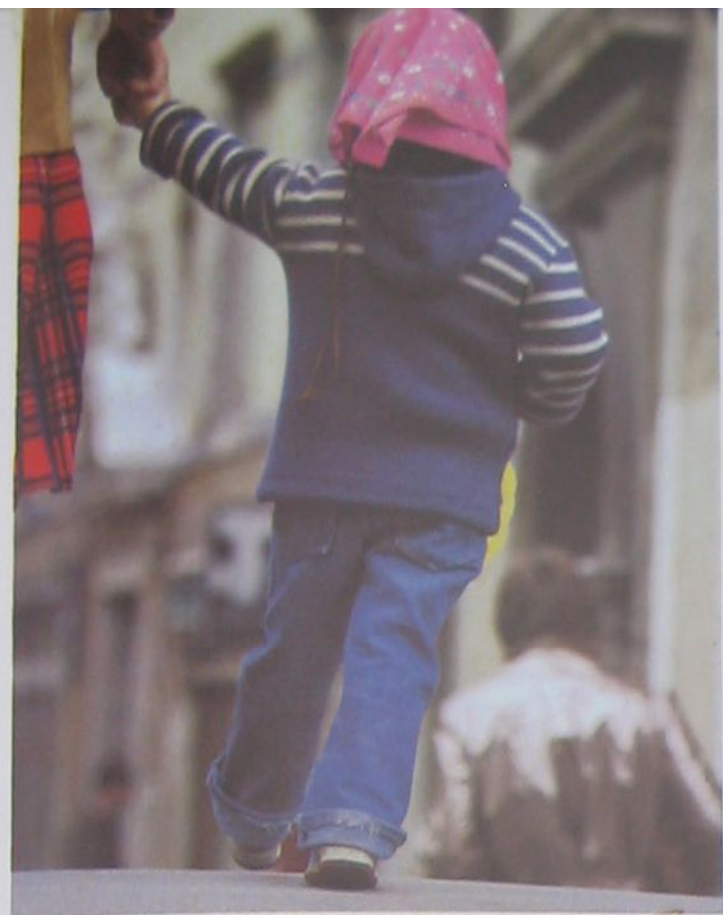
but also realized the importance of taking contingency shots in the ever-changing weather.'

Michael's aim was to present an image of a city that goes deeper than the familiar tourist shots. Whenever one visits a city, one finds that the image put

across in the brochures is different from reality. The challenge is to reveal as much as possible to those who have not been there. So Michael photographed many of the less obvious scenes, always on the lookout for a simple, clear image that contained plenty of information

Red hats 'This school party was resting in an alley. They didn't mind me taking pictures at all. I was embarrassed when I started photographing people, but after a while you get a different frame of mind.'

Crab seller 'He was showing the crabs to a woman—who didn't buy them.' 28 mm lens



Hand in hand 'I could visualize the shot as they began to walk up the small bridge, and was attracted by the girl's bright scarf. I flicked the LX to automatic and prefocused on the middle of the bridge with the 135 mm lens as they began to walk up it. I was fortunate that framing was good—I only had time for one shot, even though I used a winder on the camera.' Domes of St Mark's 'I saw the shot two days earlier at midday but waited for the softer light of a sunny late afternoon.' 200 mm lens at f/11. Laundry 'It struck me that this would look good with a diffuser—I didn't even try it without. I used my Hoya glass filter'

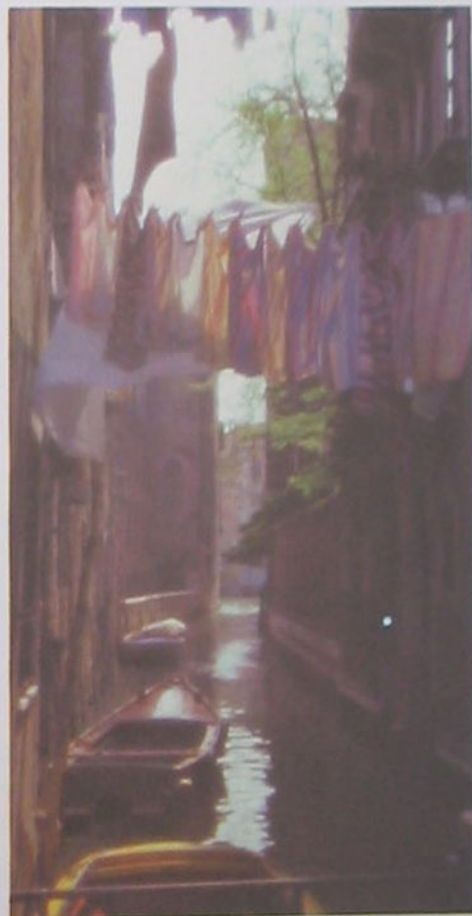
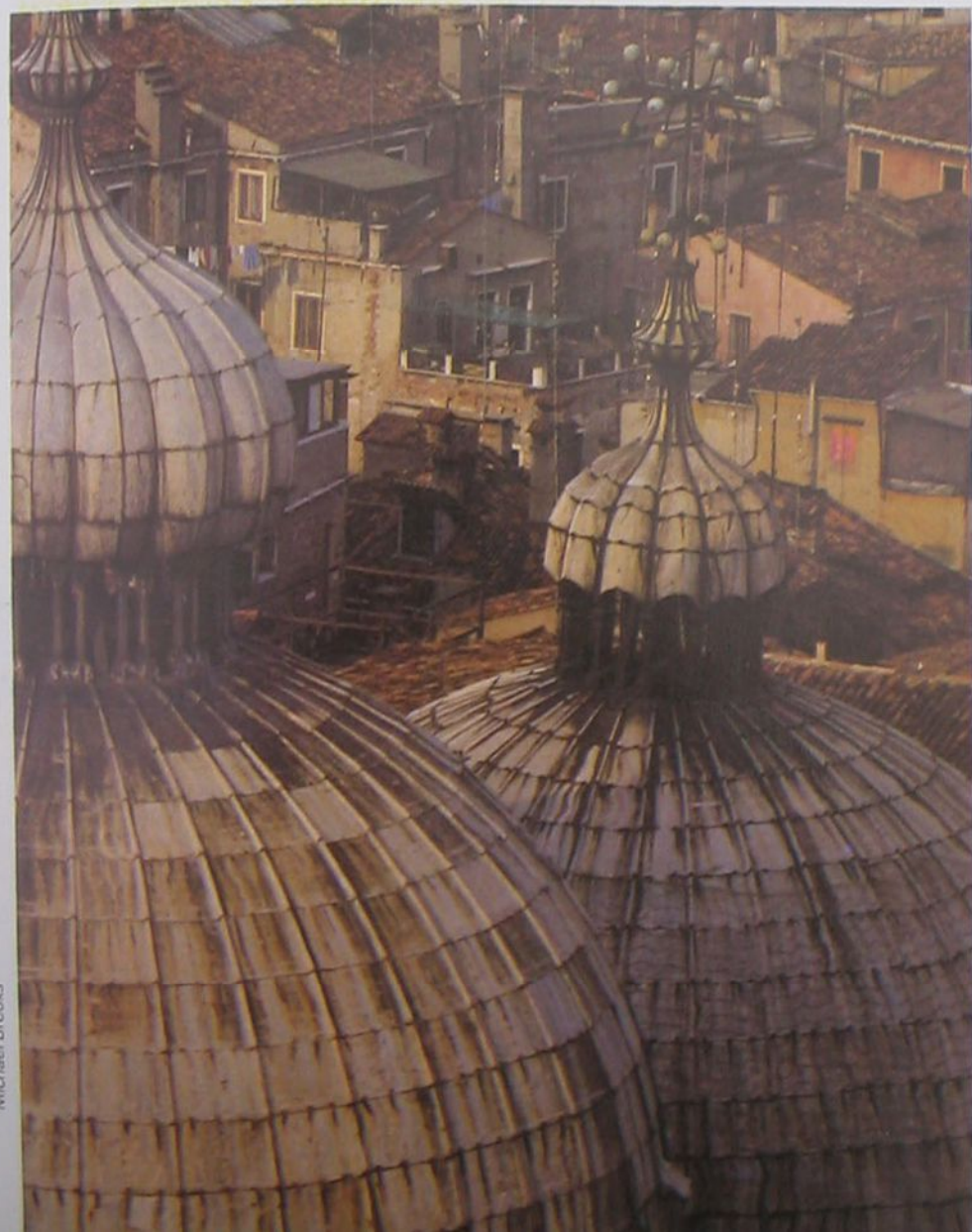
about the historic city, yet was appealing in its own right.

Perhaps most significantly, I came to resist the familiar "postcard" treatment in favour of selecting details,' said Michael. Unlike many amateurs, he took a wide variety of shots, ranging from architectural details to close-ups of people in the market and semi-abstracts.

He took his two Pentax cameras, the three-year-old MX which was his first SLR and a recently purchased LX, along with a modest range of lenses—28, 50, 135 and 200 mm. Occasionally he used a Pentax $\times 2$ converter. In all he shot 10 rolls of Kodachrome 64 and two of Ektachrome 64.

One thing that surprised Michael was the amount of time he had to spend in preparation before he even began to take pictures. He had a fairly loose schedule, but kept a permanent watch on weather reports, since the Easter week he chose had varied weather. As well as checking over his cameras from time to time, to guard against mistakes he made as a beginner, such as using the wrong film speed setting, he kept notes on the pictures he took. He carried a fairly light Velbon tripod.

Michael's approach is one of dedication. As he says, 'I just have to take



pictures.' He aspires to leave his job with an insurance company and become a full time photographer, concentrating on landscape and editorial work. From the evidence of these first published pictures, he has a good chance of success in a difficult profession.



Super-telephotos



Almost the exclusive preserve of professionals only a few years ago, super-telephotos over 200 mm are now within the reach of many amateurs. But there are many types available so what should you look for?

Long telephoto lenses, 200 mm and above, used to be thought of as exclusively specialist items, giving the professional an almost unfair advantage in wildlife and sports photography. But as the relative cost of photographic equipment comes down, more and more of these lenses are falling within reach of the amateur. While the really long lenses—over 600 mm—are still phenomenally

expensive, some of the cheaper 300 to 400 mm lenses cost little more than a good standard lens.

Long telephotos in the 200 to 500 mm range are surprisingly useful for general photography. They are by no means restricted to the traditional telephoto roles of wildlife and sport. Their main value is in bringing subjects, both near and distant, closer, allowing you to

Long lenses Compared with a 350 mm mirror lens (right foreground) telephoto lenses are long and bulky

isolate, say, small areas of the landscape or details on the side of a building. But they can be useful in other ways.

Most long telephotos, for instance, have extremely limited depth of field. This is ideal for isolating middle distance

subjects against an out of focus background—standard lenses can only do this for close subjects. This is one of the attractions for the sports photographer who wants to pick out a footballer against a crowd or the wildlife photographer shooting a bird against foliage. But it can be useful in many other types of photography. Another attraction is the way telephotos seem to compress distance, so that a city street appears full of cars, people and lampposts all jostling one another.

The very long focal lengths—1000 mm and longer—have more specialized uses: for photographing very shy wildlife, climbers on a distant rock face, or astronomical bodies, for example. Their use for general photography—mainly because of their extreme size and cost—is rather limited.

Long lenses are of two principal types: telephoto lenses and mirrors (the latter are covered in a later article). By far the majority are telephoto—few of the systems manufacturers market more than a couple of mirror lenses.

Although there are fewer long than medium telephotos on the market, there is still a wide range to choose from—Nikon alone make more than ten. The widest choice is at the 200 mm and 300 mm lengths. Further up the range—400 mm and above, the super-telephoto bracket—choice is restricted. There is quite a range of 1000 mm lenses but there are only a few as long as 2000 mm. Lenses longer than 2000 mm are very rare indeed, though 5200 mm lenses were made as recently as 1980 by Canon.

Your choice of telephoto depends upon the way you intend to use the lens and upon the price. Clearly, the main decision is what focal length to buy (see panel). But there are also a number of other factors to bear in mind.

Aperture

One of the main problems with long telephotos is the small subject area that they take in and this severely reduces the amount of light reaching the film. So long lenses inevitably have a slower effective speed than shorter lenses. As the focal length (and thus magnification) increases, so the speed of the lens decreases. Whereas a typical medium telephoto might have a maximum aperture of $f/3$, a 300 mm lens is as slow as $f/4$ and a 400 mm only $f/8$.

Since this slow speed considerably reduces the usability of long lenses in poor light, many manufacturers produce lenses designed to give a larger maximum aperture. Canon, for instance, make an $f/2.8$ 400 mm lens. The disadvantage is that in order to get the extra speed, these fast lenses incorporate extremely large front elements. This not only puts up the cost very considerably, but also the weight. While the $f/4$ 300 mm Canon weighs under one kilogram, the $f/2.8$ weighs 2.3 kg. Longer fast lenses are even more massive.

Even if you can afford the extra cost of a fast lens, the extra weight may also

restrict the lens' usability more than the lack of speed on a slower lens. Up to 500 mm, a slowish telephoto is easy to carry around in a camera bag. Fast lenses tend to severely restrict your mobility.

At the other end of the aperture scale, minimum apertures on long telephotos tend to be smaller than on shorter lenses—at least $f/22$ or $f/32$. Some 1200 mm lenses stop down to $f/64$. Long lenses can be stopped down further than normal lenses because the effects of diffraction play a smaller part in their optical set-up. With the restricted depth of field of long lenses, this facility for stopping down (which increases depth of field) is very useful so, faced with two lenses that are otherwise equal, choose the one with the

system—you can add such a lens to your outfit for only a small outlay, even if you do not use it much. The optical quality of these cheap lenses can be surprisingly good, as they are comparatively easy to make. If you are mainly interested in landscape work, where speed is not essential, a preset lens is ideal. For sports or wildlife work, however, where the time taken to stop down a preset lens could mean a missed shot, an automatic diaphragm is essential.

Comparative dimensions Two lenses, each of 400 mm $f/5.6$, can differ greatly in appearance, due to such factors as hood design, focusing mechanism and the arrangement of internal components



smaller minimum aperture.

Aperture control mechanisms also vary from lens to lens. Although, most modern lenses, including telephotos, have automatic diaphragms that stop down to the set aperture as you press the shutter, a few long telephotos still have manual or preset aperture control. In these, you must close the iris manually.

Manual lenses have the disadvantages that either shots can be missed in the time it takes to close the iris, or they can be overexposed if you forget to stop down after focusing at full aperture. But these are offset by the cheapness of the

Focusing

Focusing mechanisms are particularly important in telephoto lenses because of the narrow depth of field and the large movement. Focusing is usually carried out in the conventional way, by turning the focusing ring on the lens barrel. But there are two types of focusing mechanisms. In some lenses, the optical assembly is racked out and the front of the lens moves, just as with standard length lenses. Other lenses, however, at both ends of the range, are *internal focusing*, in which the overall length of the lens remains the same while



200 mm lens Magnification increases with focal length, but image area is reduced



300 mm lens A smaller area of the object is framed, shot from the same distance



400 mm lens The extreme length of these lenses makes camera shake very likely



1000 mm lens The powerful magnification of a super-telephoto can clearly be seen

elements within the lens are shifted.

Internal focusing lenses usually require less turning of the barrel for a given change of focus—this is important because standard telephotos have very long focusing movements and limited depth of field—and tend not to adjust their focus position when being carried around on the camera, as standard focus lenses do. This means that you can focus very quickly and even preset the focus so that you can simply point and shoot if necessary. Furthermore, the front element always stays in the same orientation, which means that you do not need to readjust polarizers or graduated filters after focusing. The simple barrel also makes the internal focusing lens easier to handle.

The disadvantage of internal focusing is that it is generally more difficult to make than standard focusing. Most of the lenses with internal focusing are therefore comparatively expensive. Although there are a number of comparatively cheap internal focusing telephotos, some may well have sacrificed optical quality. So it is probably safer to stick to standard focusing if you are buying a low priced lens. Some of the better lenses using standard focusing movements have a detachable focusing handle that fits on the focusing ring and makes focusing almost as easy as with internal focusing. Often this handle has two screw-in positions for rapid focusing. Nikon make a separate *focusing unit* of this type which will accept a range of super-telephoto heads.

A feature worth looking for, whether you buy a standard or internal focusing lens, is a *focus lock*. This is not a standard feature but, nevertheless, one which can prove very valuable. It allows you to preset a focus on the lens but still alter the focusing up to infinity, and simply snap back to the preset focus whenever you need it. This means that you could, for instance, preset the focus on a bend at a motor race, change focus for a few shots of the cars as they come into the bend and then snap to the preset when they reach the bend.

Alternatively, if rapid focusing is important, you could buy a Novoflex lens equipped with a Rapid Follow Focus (RFF) attachment. The RFF attachment is basically a pistol-grip carriage that fits the lens and allows you to focus simply by squeezing the spring-loaded grip. These lenses do not have helical focusing gear and so are very simple and relatively inexpensive. They can be adapted to fit most 35 mm SLRs and have proved popular with sports photographers.

Minimum focusing distances vary greatly. For example, most 300 mm lenses can focus down to about 3.5 m but some models can focus as close as 1.4 m, at which point the subject is only 3.3 times its image size on film.

This point is often overlooked when choosing a lens, but it can contribute greatly to the usefulness of a lens. A

close-focusing telephoto lens is ideal for photographing, say, a butterfly that might be unwilling to settle on a flower if you are nearby. If you are keen on wildlife work, it is worth checking on the closest focus distance and what this will include in the frame, before committing yourself to a particular lens. You can estimate how wide its field of view will be at close distances by using a shorter lens at those distances. A 400 mm lens has one third of the field of a standard



lens, for instance, so you can estimate in the viewfinder roughly what the field of view of the 400 will be at the closest focusing distance. Bear in mind that you can use extension tubes to reduce the closest focusing distance but optical quality is often poor and you may run into problems with the very restricted depth of field.

Size and balance

Long telephotos are large and heavy, but there is a trend to making them smaller. However, in order to achieve compactness, some manufacturers have sacrificed optical quality in their cheaper models. In particular, cheap lenses suffer from *pincushion* distortion (see page 906) and, if you are buying a cheap compact telephoto, it is worth checking for this. With the lens on the camera, aim the camera at a straight vertical edge so that it is in the centre of the viewfinder. Then slowly pan the camera so that the edge moves across the viewfinder. If the lens suffers from pincushion distortion, the edge will bow in at the middle as it comes near the edge of the frame. Repeat this check with another lens to ensure the viewfinder is not at fault.

Although compactness is clearly desirable, a heavy lens need not be unmanageable if it is properly balanced. Remember, though, that it is not the lens itself that must be balanced but the lens-camera combination. Clearly, with very big lenses, the combination's point of balance is underneath the lens rather than the camera, so many lenses are fitted with tripod sockets.

Most of the more expensive lenses

have the tripod bush attached to a collar in the middle of the barrel. This collar can be rotated so that you can shoot with the camera at any angle between the horizontal and vertical formats, without removing the camera from the tripod. Most tripod collars only rotate through 90° and this may prevent you from getting the horizon square if you cannot level your tripod properly.

The cheaper lenses tend to have fixed tripod sockets: one underneath and one

on the side. This means you must remove the unit from the tripod to change the format. It also means that you cannot shoot at angles outside the 90° plane.

Threads and mounts

Many long telephotos have threads on the front for screw-in filters, but filter diameters tend to be large—72 mm is common—and filters to match are fairly expensive. So the larger lenses have a slot towards the rear of the lens which

accepts smaller, less expensive unthreaded Series VI filters. It is possible, though, to use square filters on the front of most long telephotos.

Lenses come in a diversity of mounts and usually a lens will fit only one make of camera. However, most of the independent manufacturers' telephoto lenses are geared to take the Tamron Adaptall connectors which allow them to be fitted into several different types of SLR camera systems.



Image quality Shots taken out of doors on a windy, hazy day by a budget (left) and a mid range (far left) 400 mm lens show only subtle differences in quality

Typical telephotos are usually of the external focusing type, in which the physical length of the lens varies as the barrel is rotated. A lens that employs internal focusing (below centre) has several advantages, including compactness, a smooth action and a constant length



When light strikes film

In night photographs, the image of a bright light is often surrounded by a halo. This is just one of the effects of the scattering of light from the grains in the emulsion

way we see it.

Grains in the emulsion affect the image primarily because their surfaces point in many different directions. Light falling on the film or passing through is, therefore, reflected in many different directions—that is, the light is scattered. The effect of light scattering on acutance is described on page 1682, but it can also cause irradiation and halation during exposure and affect the way we see different negative densities.

Irradiation and halation

When light falls upon the emulsion during exposure, some is reflected back towards the lens, some is absorbed by the silver halide crystals to form the latent image and some is scattered.

Naturally, the scattering is most pronounced where there is most light. Light is scattered a little way around every bright spot. Some of this scattered light is reflected back to the lens, some is reflected through the film base, and some is absorbed by the grains around the bright spot. So these grains are exposed and become developable. The image of every bright spot is therefore spread out a little and this spreading is referred to as *irradiation*.

Light reflected through to the film base, on the other hand, hits the back of the film base and is internally reflected back into the emulsion where it is absorbed. Because the light strikes the back of the film base at an angle, the light is reflected back into the emulsion some distance away from the bright spot and forms a secondary image, an effect called *halation*.

Normally, the effect of both irradiation and halation is just to diffuse the image and reduce resolution. But in subjects with small intense highlights, particularly against a dark background, halation may create a perfect ring around the image of the light. The bright halo around street lights at night or a bright star are typical of this effect.

Clearly, since both halation and irradiation are light scattering effects, they are most pronounced when light scattering within the emulsion is most severe. This



Star rings The small, intense highlight of a distant star can create an almost perfect halation ring against the dark night sky. Irradiation also softens the image of the star

It is very easy to think of the photographic image as being infinitely thin, and forget that it is in fact made up from grains of silver in an emulsion layer. Although the

difference might seem unimportant, the granular nature of the emulsion can have a number of significant effects on both the way the image is recorded and the

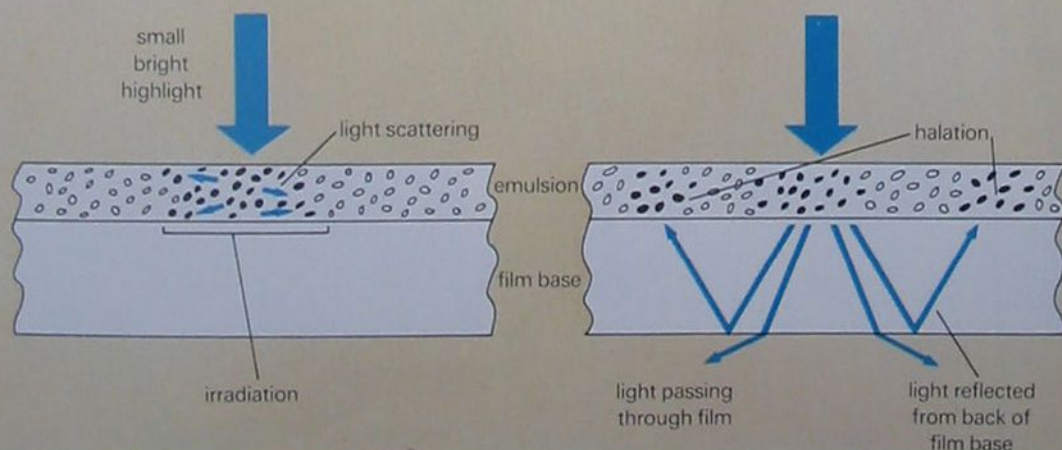
How the image of a highlight is spread out

Halation

The image of a small, bright highlight is spread out because surrounding grains are exposed by light scattered or 'irradiated' by grains in the highlight

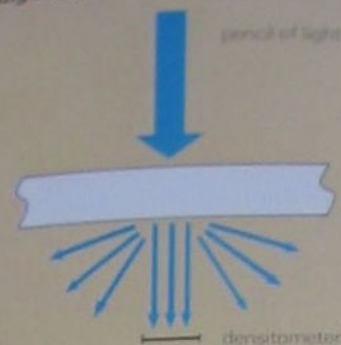
Irradiation

When light scattered from a small highlight strikes the film base, it is reflected back into the emulsion a little way from the highlight to form a small halo image

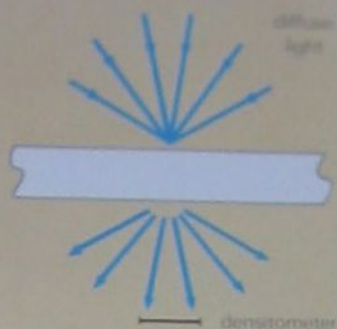


Different measures of film density

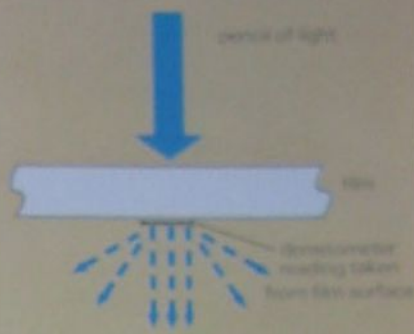
Specular density is a measure only of light passing straight through the film



Diffuse density includes scattered light as well, either by using a diffuse light



source (left) or by taking a reading right up against the film (right)



is why a bright light source gives the most obvious halation and irradiation—though it may need surrounding darkness to show it up. But they are also severe when the picture is overexposed, or with a thick emulsion. So to give a high resolution image with the minimum of irradiation and halation, you need the minimum exposure and a slow (thin-emulsion) film. Additionally, irradiation can be reduced by developing in a *surface developer* which does not penetrate deep into the emulsion, and affects only the grains near the surface.

Halation is also cut down dramatically by the use of *anti-halation backing dye*. The backing dye is meant to absorb scattered light and prevent it being reflected back into the emulsion. It used to be simply incorporated into the gelatin *anti-curl* layer on the back of sheet and roll film. With modern 35 mm film, however, it is more commonly included within the film base absorbing both light travelling towards the film base and light reflected from it.

Density

The visual image of any black and white photograph is simply varying densities of silver grains. Light is needed to make densities visible, either shone through the negative or reflected from white paper back through the emulsion. But, just as during exposure, light is partially scattered as it is transmitted through the emulsion and this can alter the effective density.

In particular, light scattering within the

emulsion means that the density varies according to the nature of the light source—whether it is daylight, the light from an enlarger or the light from a projector—and the way the transmitted light is received.

Light sources can be divided into two principal types: *specular* and *diffuse*. Specular lighting is from a spot source, such as a condenser enlarger, that gives a thin pencil-like beam of parallel light. Diffuse lighting (like daylight), on the other hand, falls upon the emulsion from all directions.

When photographic scientists measure the density of the negative, they can measure either its *specular density* or its *diffuse density*. To measure specular density, a specular light source is used and the intensity of the light transmitted is measured (with a densitometer) some distance away from the negative. The idea of measuring at a distance is to ensure that only light passing

straight through the negative is measured—light scattered in the emulsion is ignored.

The diffuse density, on the other hand, is measured either by using a diffuse light source or by taking the densitometer reading close up to the negative. With the densitometer close to the negative, it measures all light passing through the negative from a specular source, including scattered light. With a diffused light source measured at a distance, the result is exactly the same. Sometimes, the *doubly diffuse* density of the negative is measured—taking a densitometer reading right up against the negative and using a diffuse light source—but this is rare. Since only direct light is measured by specular density, while all light is measured with diffuse density, it is clear that with specular density, the densitometer reads less light—that is, a higher density. So specular density is always greater than diffuse density.

The ratio between specular density and diffuse density is referred to as the *Callier coefficient* (also known as the *Q factor*), after the Frenchman André Callier who studied the subject in 1909. Because the proportion of light scattering in the emulsion depends on the quantity of grains, so the Callier coefficient varies with factors that affect the quantity of grains—the density, grain size and emulsion thickness.

The Callier coefficient is greatest where the negative is densest, because there is a great deal of light scatter; it is least (a value of 1) with completely clear film. From this, you can see that in a negative with both dense and clear areas, the ratio of specular density to diffuse density varies over the negative. Dense areas have a high specular density in comparison to diffuse density; in clear areas, the difference is low. This means that with specular lighting, the contrast between dense areas and clear areas is enhanced—an effect known as the *Callier effect*.

The Callier effect has a number of practical results. It influences the choice of light sources for enlarging, for instance (see page 2206). It is also the reason why glossy printing paper gives higher contrast than matt paper. With matt paper, light is scattered in all directions, so blacks never look completely dark from any angle.

Broom head The image of a street light at night is often spread out into a fuzzy glow because light is irradiated by scattering from the film grain into the surrounding dark area



John Heseltine



Bill Brandt

One of the most innovative of British photographers, Bill Brandt has achieved world-wide respect for the immediacy and intensity of his black and white images

Over the last 50 years, during which his name has become almost legendary, Bill Brandt has been one of the most influential of all British photographers. Renowned for his distinctive and often aggressively dramatic black and white work—from unnerving nude studies to brooding landscapes—he has been the inspiration to a whole generation of

photographers. And his emotive documentary work for *Picture Post* in the 40s made an unforgettable contribution to the movement that led to the creation of the Welfare State in Britain. Above all, Brandt's images—whether documentary or aesthetic—are charged with atmosphere containing an intense quality that captures the eye, forcing the viewer to

see what the photographer himself has seen with his own eyes.

His career began humbly enough in 1924 when, as a frail young man of 20, he set out to become a commercial portrait photographer. He had wanted to train to be an architect, but his family felt that this was too rigorous a career for someone who had been plagued all his life by ill health. At the time, photography seemed less demanding.

Brandt's lucky break came when, through a family connection, he was engaged to work as an assistant to the American photographer Man Ray, in Paris. When he arrived in Paris the artistic movement known as Surrealism was in its heyday and Man Ray was a key figure. The surrealist's ideas affected him strongly and there are undoubtedly



Bill Brandt, 1966 *A self-portrait taken on the East Sussex coast*

Coal-searcher, 1937, *returning after searching the tips for coal nuggets during the depression*

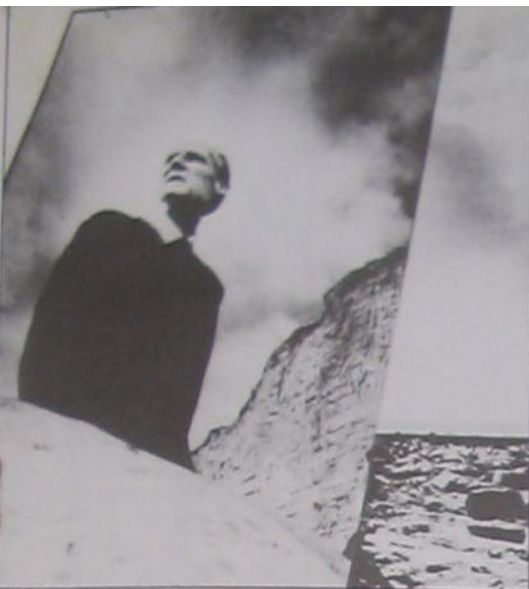
Halifax, 1937 *His cityscapes are enigmatic images, reducing the subject to the bare essentials*

Wiltshire landscape, 1948
Copses framed by Barbary Castle's ancient mounds

Wuthering Heights, 1944 *A low angle emphasizes the drama of this famous spot in Yorkshire*



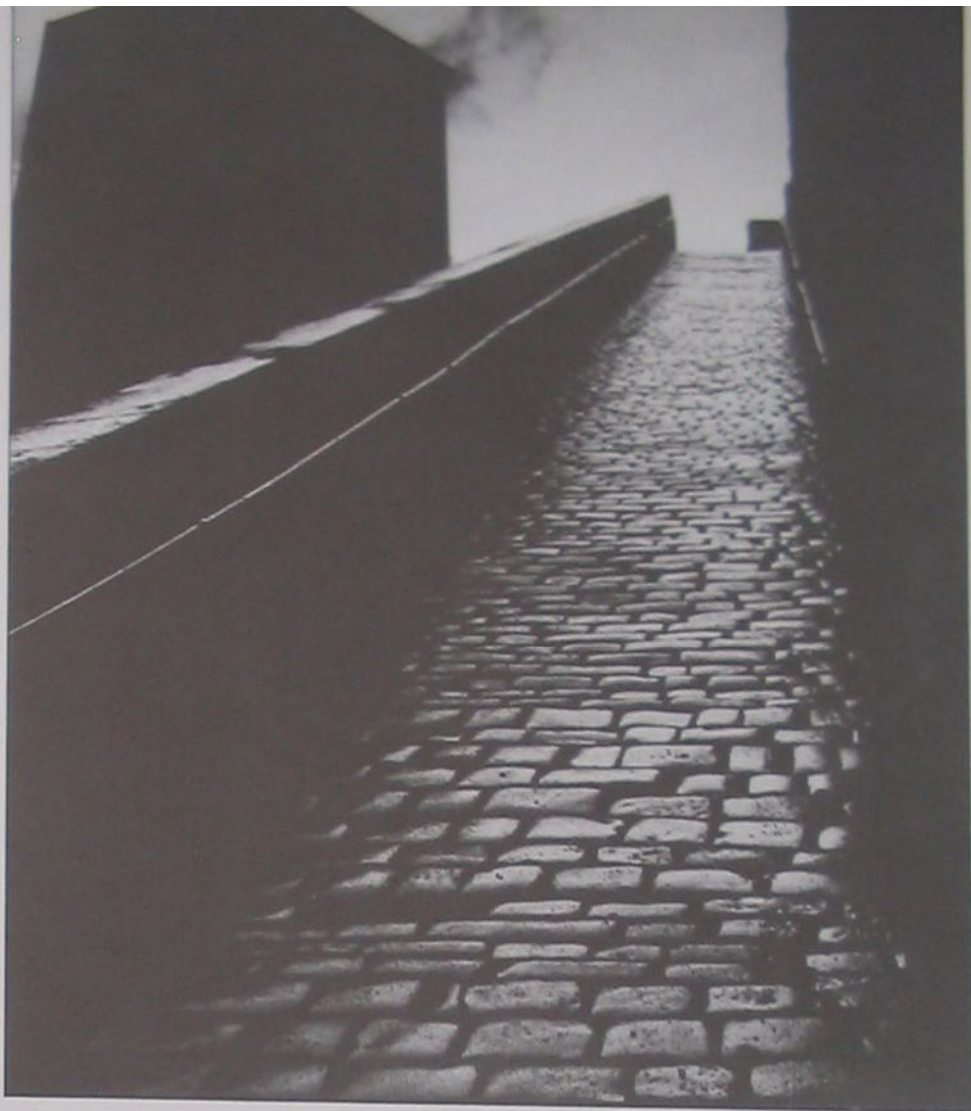
Bill Brandt/photographs from *Shadow of Light* (Gordon Fraser)/Marlborough Fine Art



many surrealist influences in Brandt's pictures even today.

Man Ray's work was highly original and he was an excellent portraitist. Brandt learnt many new approaches from him, even though the two men did not develop a strong personal relationship. As Brandt has said, Man Ray 'had a new way of looking at the world. He saw everything differently. This gave me a new excitement about photography and the world as well'.

Also important were the many hours he spent alone in the studio, looking at photographs and studying literary reviews and art journals. And while he was in Paris, the Luis Bunuel-Salvador Dali films *Un Chien Andalou* and *L'Age*





Bill Brandt/photographs from *Nudes* 1945-1980 (Gordon Fraser)/Marlborough Fine Art

d'Or further changed Brandt's ideas. These films showed clashing aspects of society next to each other to highlight the differences. It was a simple, but extremely effective technique that Brandt later carried over into his own documentary work.

In 1931, Bill Brandt returned to London where he occasionally worked for the magazine *Weekly Illustrated*. His first regular photojournalistic work came in 1935 when he began illustrating a weekly column written by a friend in a newspaper called the *News Chronicle*.

He was also soon hard at work collect-

ing the material for his book *The English at Home* which was published in 1936. Although *The English at Home* showed up dramatically some of the iniquities of English society, the approach was totally objective, and free from personal comment. This is its strength. He simply shows the reader the appalling living conditions of people living in London's East End while at the same time revealing aspects of life in England's most aristocratic and wealthy households, and leaves the reader to judge for himself. As Raymond Mortimer said in his introduction to the book, 'Mr Brandt shows

himself to be not only an artist, but an anthropologist. He seems to have wandered about England with the detached curiosity of a man investigating the customs of some remote and unfamiliar tribe.'

After the publication of this book, Brandt began collecting material for his next book, *A Night in London*, which was eventually published in 1938. This book shows the same marked social contrasts but is shot through by a strong sense of nostalgia. Brandt has said that he had a feeling at the time that much of what he was recording would not exist for much

longer. Subsequently World War 2 was to bring about sweeping changes in British society.

In 1937, Brandt also went to the north of England to record the harsh realities of mass unemployment and inadequate living conditions in places such as Halifax, Newcastle, Durham and Sheffield. The results are as revealing and distressing as the images in *The English at Home*. Only a few of these pictures were actually published at the time, but they were later used to powerful effect during the 1940s in the illustrated magazine *Picture Post* as part of a campaign to support the introduction of the welfare state.

At the end of 1938 Brandt began working on a series of photo essays for *Picture Post*, then just beginning, and he also contributed to several international publications including *Illustrated*, *Verre* and the Surrealist magazine, *Minotaure*.

East Sussex Coast, 1978 Set against the austere cliffs and rough pebbles of the beach, the woman's form takes on an even more sensuous appearance

Portrait, London, 1952 Like most of Brandt's nude studies this picture reduces recognizable forms to their essence, creating an element of the surreal

Belgravia, London, 1951 Brandt often used an extreme wide angle for his nudes, influenced by Gregg Toland's photography in Orson Welles' film 'Citizen Kane'



During the war, Brandt found himself working not only for *Picture Post* and *Life* magazine but also as an official government photographer. His first government commission produced some of his finest work. This was photographing the effects of the night bombing raids on London. Views of streets darkened by the blackout and taken on long exposures by moonlight revealed an entirely new view of the city. Remarkable too were his portraits of Londoners sheltering from the raids in the underground railway stations. Many of these pictures were first published alongside drawings by the sculptor, Henry Moore, in the popular and innovative magazine *Lilliput*.

Brandt was also commissioned by the British Ministry of Information to document the results of the bombing on the cities of England. This work provided the basis for what later became the National Buildings Record (now named the National Monuments Record) and allowed him to develop his personal interest in architecture.

During the war Brandt also began to take a striking series of portraits of poets and writers, which again appeared in *Lilliput*. Over the next decade, *Lilliput* continued to commission portraits of artists, painters, illustrators, musicians and film-makers from Brandt as did *Harper's Bazaar*, which also assigned him to do fashion work. And he went on working for *Harper's* until he was well



over 70 years old.

At about the same time that Brandt began this series of portraits, he also started taking landscapes and other pictures for his book *Literary Britain*, published in 1951. Many of his strongest landscapes were produced at this time.

Brandt's work was continually moving in new directions. When he saw Orson Welles' classic film *Citizen Kane* in 1943, his interest in architectural photography for the National Monuments Record was rekindled. Welles had shot with wide angle lenses and specially built sets and the new look this gave to rooms fired Brandt with an increased fascination for photographing interiors.

The wide angle look also influenced his work on the nude—the first example of his distinctive wide angle nudes appeared in *Lilliput* in 1944. Later, he pursued this approach vigorously.

At first Brandt used a camera made in the early 1900s for use by auctioneers and the police. He bought it from an antique dealer for a nominal sum. The wide angle lens and pinhole sized aperture gave pin sharp detail but with amazing distortions if the subject was close to the lens.

Because the image in the viewfinder of this camera was so dim, Brandt was working almost 'blind' and he suggests that his early nudes were taken not by him, but by the camera. This almost 'accidental' approach suited the rather experimental nature of his style. But as his eye developed and his ideas became

Parlourmaid running a bath, 1936

One of a series of pictures taken in the homes of the wealthy classes for the book 'The English at Home'

East End girl dancing the 'Lambeth Walk', 1939. Brandt's photographs of the poor were not just catalogues of misery but often showed the brighter side of life in the slums



more clearly formed, he started to use a Hasselblad.

Just as in his portrait work, many of his nudes rely for their impact on their settings and he gradually began to take more and more of his pictures out of doors—in particular, on stony beaches.

Over the years, his nudes became more and more outrageous and disturbing. His early nudes are soft and gentle, if at times puzzling and challenging. But later they include strong elements of horror and alienation. The unnervingly claustrophobic wide angle view certainly contributes to this effect, but Brandt's increasing tendency to print to give maximum grain and stark contrast is also important.

Bill Brandt has always felt strongly that

the photographer should be closely involved in producing final prints. Indeed, much of his time in recent years has been taken up with producing fine prints of his most popular work. As he has said, 'I consider it essential that the photographer should do his own printing and enlarging. The final effect of the finished print depends so much on these operations. And only the photographer himself knows the effect he wants.'

Beyond this, Brandt feels that if the photographer is to know what effect he wants, he must be stimulated by his subject—he must respond to his subject positively. Significantly, Brandt seems to believe that photography is much more about 'seeing' than careful composition—providing the photographer is



Bill Brandt/photographs from *Shadow of Light* (Gordon Fraser/Marlborough Fine Art)



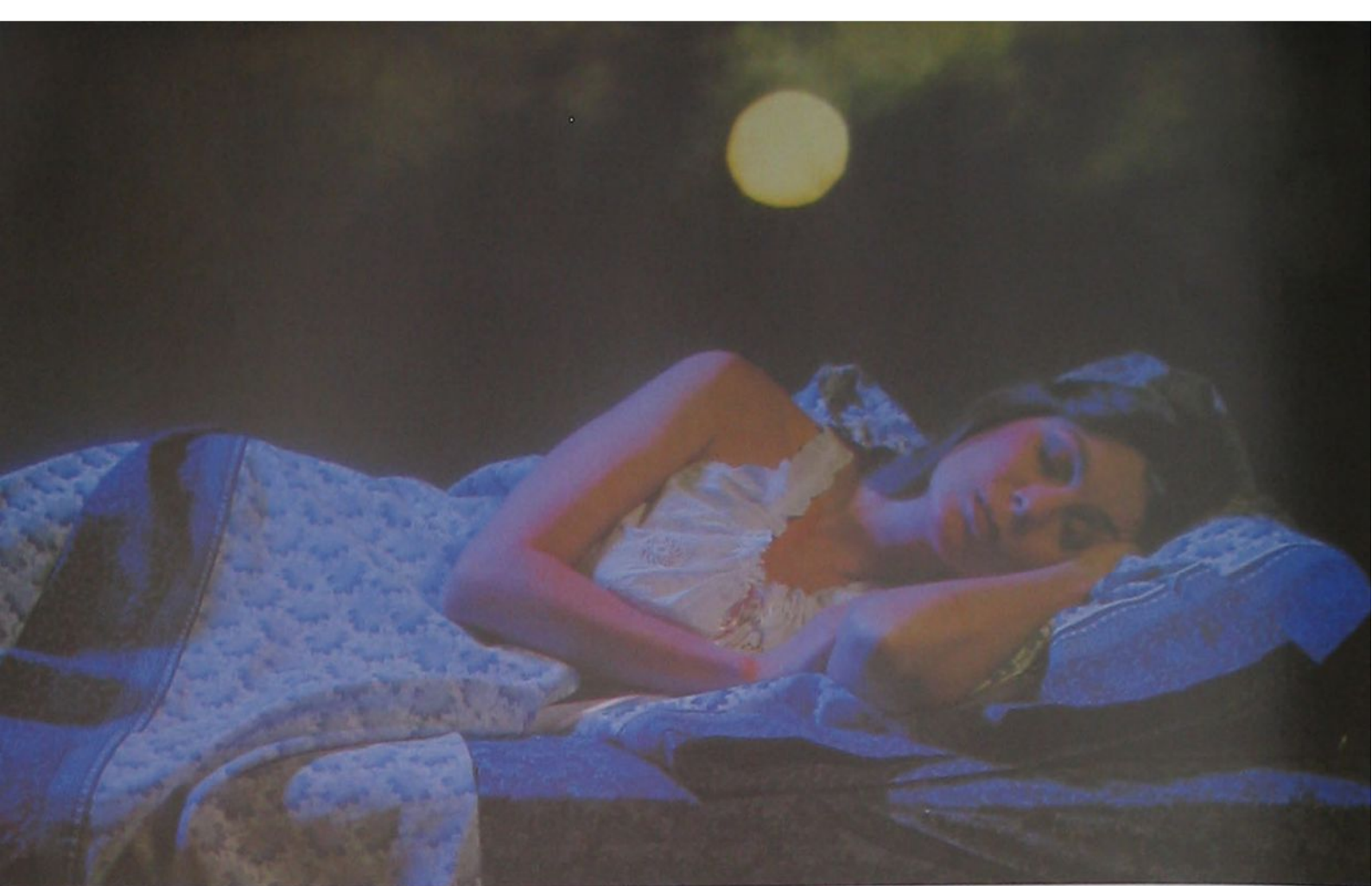
sufficiently receptive, composition can be almost instinctive. But it is important, he feels, to come to a subject without preconceived ideas or expectations. As he says 'If there is any method in the way I take pictures, I believe it lies in this. See the subject first. Do not try to force it into a picture of this, that or the other thing. Stand apart from it. Then something will happen. The subject will reveal itself.'

Man Ray, 1970 *The Surrealist painter and photographer was Brandt's mentor at the beginning of his career in 1930's Paris*

Peter Sellers portrayed as the epitome of the English gentleman as he sits on a park bench reading a copy of *The Times*



Bill Brandt/photographs from *Portraits* (Gordon Fraser/Marlborough Fine Art)



Improve your technique

Front and back projection

You can make your portraits and still lifes even more interesting by introducing novel or location backgrounds. And this can be done quite easily in the studio by using a projector and a screen

You do not need to go to the Caribbean to shoot a friend on a tropical beach or to France to picture a bottle of Bordeaux in an 'authentic' setting. You can put all kinds of backgrounds, exotic and mundane, in your pictures without moving from your studio simply by projecting a slide of the scene on to a screen behind the subject.

Slides can be projected either from behind the screen (back projection) or from in front, with the projector close to the camera (front projection). Although you can buy sophisticated—and expensive—equipment designed especially for background projection, you can

achieve quite acceptable results using just a normal slide projector.

Most projection techniques are straightforward and the problems occur more in the choice of suitable slides, equipment and the lighting arrangement rather than in taking the shot. Although there are a number of different approaches, certain principles of projection apply to all the methods.

Projection principles

When using either back projection or front projection, it is important to prevent light from the studio lamps falling on to the screen or projection

surface. Light spillage of this kind reduces the contrast and colour saturation of the background image. Barn doors and snoots (see page 1083) should be used on the lights to direct the light on to the subject while shielding the screen.

Unless you are using an abstract or obviously non-realistic background it is also important to match the direction and quality of the lighting on the subject with that of the background slide. This may mean using colour balancing filters on the projector to match the colour of the studio lighting.

Perspectives in both the subject and screen image must match. This is



Moonlit sky Front and back projection are most useful for producing surreal or slightly abstract pictures

especially important if perspective lines are continued or repeated in the background. A shot looking down on a model posed in front of a picture of a street scene shot from ground level would not look right.

Scale also plays an important part here, and you must adjust the image until it is precisely the right size for the subject. If your projector has a zoom lens, you can simply zoom in or out to achieve the right scale. Otherwise, you must move either the projector, the screen or the subject.

Background shots taken on wide angle lenses show an exaggerated distortion toward the sides, especially of strong vertical lines like the edges of buildings. This can be used creatively, but for most applications the background should be distortion free. Ideally, the camera lens should have an angle of view as close to that of the background slide as possible. In fact, the foreshortening effect of a longer than normal lens is often preferred, not only for a tighter image but also because the depth of field is shallower and the inevitable separation of foreground and background looks more natural and not so contrived.

If the background is intended to be far distant, too much depth of field in the slide may ruin the effect—it is sometimes a good idea to have the background out of focus. Do not use a slide with the foreground out of focus or the composite will have two points of focus. The slides used should also be in glass mounts to prevent them from buckling. It is also a good idea to use the largest format possible so that the effect is not ruined by grain—6 × 6 cm slides are ideal.

Projection techniques can be used to



Back projection The shots above show a basic set-up—using a standard projector and a translucent screen—and the type of result you can easily obtain

Combined images The small shots below show the components which are combined to form the main picture. Note how grey the screen is without an image on it



recreate the view through a window or door in an interior shot. In this case, the perfect match between the projected image and the main subject is not so important. The studio lighting on the subject does not have to match with the daylight in the slide, for instance, and you can use a wider angle lens. But, depending on the brightness of the exterior and the direction of the sunlight, it may be necessary to backlight the subject to simulate the light coming through the window.

Front projection

The simplest and cheapest technique is front projection using a standard slide projector to throw an image on to a white surface, such as background paper. The subject is placed in front of this image and lit separately using tungsten or quartz lights, to match the light source of





the projector. You should use artificial light film or daylight film with suitable filtration.

The projector must be set up slightly to one side so that it projects *behind* the subject, otherwise the image will show up on the subject as well. This causes some distortion of the image, and so the original picture must be chosen with this in mind. Either use a picture which does not suffer when distorted slightly, such as a landscape, or use the distortion to create interesting effects. Unless you want abstract effects, make the angle between the camera and the projector as small as possible, not only to minimize distortions, but to avoid problems with focusing the projector lens.

If you take background shots specifically for this type of projection, you can try shooting scenes with at least one dark area. With the projector near the camera, you can project the slide directly on to the screen and the subject, with the latter placed so that it is in the dark area of the image. However, although simple, this approach does tend to be rather limiting.

A much more sophisticated and versatile system uses a special projector and screen. This is the type of front projection used by professionals. The projector, which is usually set pointing vertically upwards, throws the image on to a semi-silvered mirror set at 45° in front of the camera lens. This reflects it on to the screen and subject. The camera 'sees' through the mirror, so that the projector beam and camera view are on exactly the same axis and the shadows cast by the subject are directly behind it and out of view.

The screen used is a beaded, high gain type (see page 1815) which has a very high reflectance and a narrow reflectance angle. This means that the image on the screen is very bright—much brighter than the image falling on the subject. When the film is exposed for the screen, the image on the subject is very underexposed so that very little of it

Lighting set-up Note how the lights in the front projection set-up above are positioned and shielded to avoid light reaching the screen. Backlighting is used (bottom) to remove a black line on the shoulder (top) caused by fringing

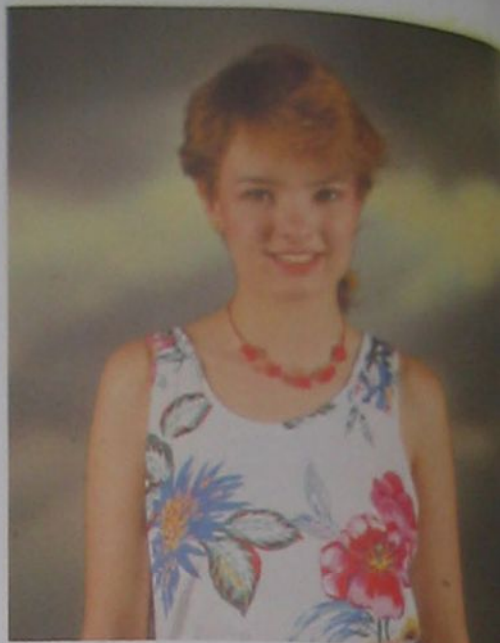
can be seen. Furthermore, when the subject is lit separately, all remaining traces of the projected image are washed out.

Professional units such as the Bowers Front/Pro, use a flash head in the projector to make the exposure, though a modelling light is included for viewing. This means that you can use studio flash units to light the subject. These lights must be kept out of the reflective area of the screen which is roughly 20° to 30° each side of the camera/projector axis, depending on the particular screen.

Although these units are very expensive (the screens alone can cost as much as a roll film SLR), it is possible to hire them, and some studios offer them as additional facilities. The better models have the projector, mirror (or beam-splitter) and camera mount contained in the same unit. This is important as the camera lens and projector beam must be accurately aligned. If they are not the result is a black line, known as *fringing*, round the subject caused by shadows, and producing a 'cardboard cut-out' effect. Front projection systems which have the various components separate can take some time to set up, and accurate alignment is often difficult.

Once the units are set up, they are very easy to use. But to get the best out of them there are a few techniques you can use. For example, it is a good idea to have your subject between one and two metres from the screen. This gives enough separation to allow you to light the subject without spillage on to the screen, but without causing depth of field problems.

Even with properly aligned units, some fringing may occur. To overcome this you should use some backlighting,



and possibly some toplighting too. This lightens the edges of the subject, and with some surfaces, such as pale materials or skin, slight flaring often occurs, which improves the image.

Beware of using a camera angle and composition which includes the feet of a standing person. As there is no shadow coming from the feet, the effect is to make the person look as though he or she is floating.

Back projection

Similar problems can occur with back projection. This is the technique which was widely employed in movie work, and is still sometimes used. The advantage of back projection is that it produces results almost as good as those of sophisticated front projection systems, but using much cheaper equipment. The disadvantage is that you need considerable space behind the screen to give a large enough image. It is sometimes necessary to reflect the projector beam off a 45° mirror, or zig-zag it

between several mirrors, to cut down on the required space.

With back projection there is no danger of your subject casting shadows or producing fringing. But it is necessary to choose your screen material very carefully if you are not to create other problems.

A wide variety of screens and other materials can be used, to varying degrees of success. Professional back projection screens, as used for movie work and audio-visual displays, are made of acrylic substrates (or glass) which diffuse light evenly (so preventing 'hot spots') and absorb ambient front light. They are supplied in neutral grey and white, as well as a range of tints, and are designed for daylight use. However, the areas behind the screen must be dark if you are to get a bright, detailed and reasonably contrasty image.

As with all non-rigid screens, the material should be stretched tight so that there are no wrinkles, which would otherwise show in the final picture. For this reason, the larger screens are laced

be used effectively as backgrounds for small scale still-lives.

Alternatively, you can make your own screen. Various types of material are available, including a special back projection type, which comes in rolls 1.6 m wide. If a proper screen is not available, sheets of Kodatrace or matt celluloid can be used, as long as they are wrinkle free.

Unfortunately, many materials which might seem suitable for back projection have either a texture or a grain structure. This can show up clearly if the screen is sharply in focus in the final picture. Although it might not matter with abstract backgrounds it makes a realistic effect impossible.

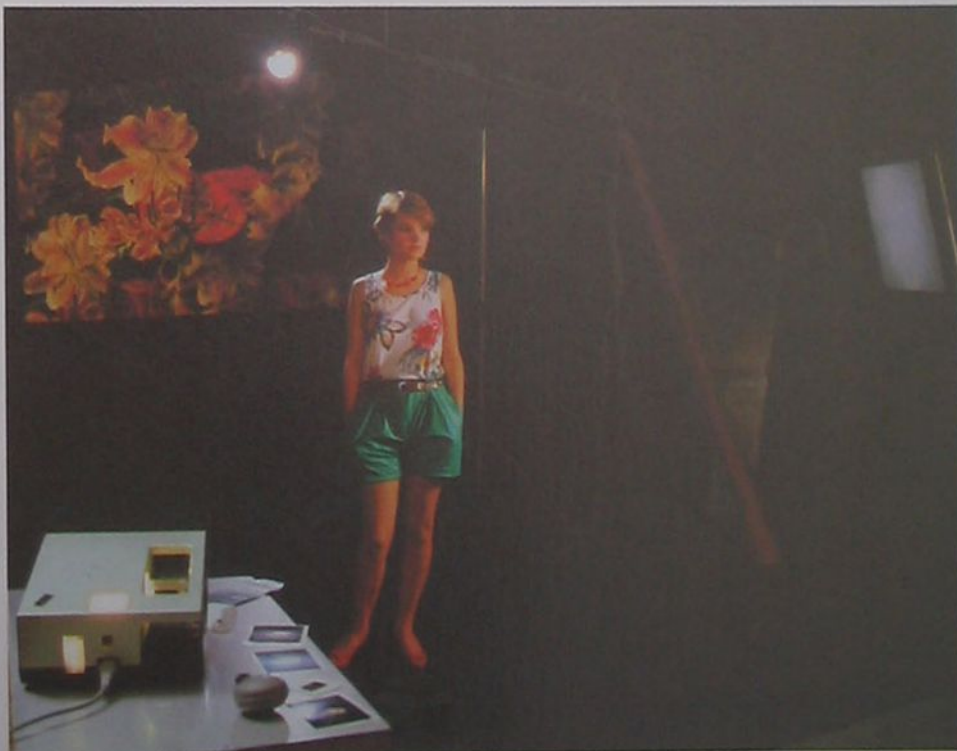
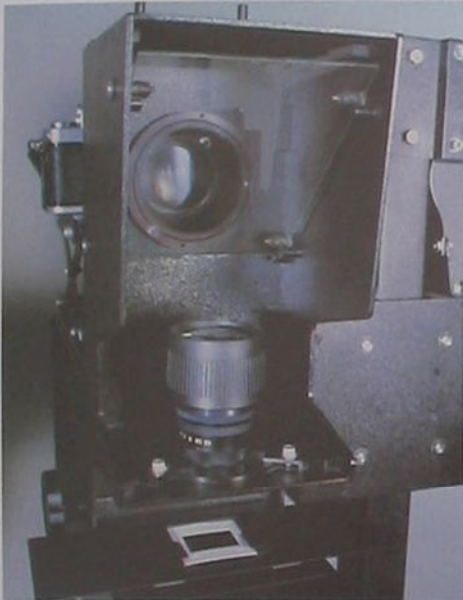
A more difficult problem to overcome is that of hot spots. Proper back projection materials diffuse the light to give even brightness across the whole screen area. Hot spots are reduced by having a thicker screen, but this also cuts down the light level. It is a good idea to experiment with different materials to find the best one for your purposes.

As with the simpler type of front projection, tungsten or quartz lights should be used to light the subject. A few special back projection systems are available which feature electronic flash sources in the projector. But these are prohibitively expensive for the amateur. Unless you are using a special daylight screen, be careful to shield the screen from the studio lights to prevent a washed-out look. Transparencies taken for back projection should also be of fairly high contrast to compensate for any wash-out remaining. Any type of projector can be used, but space usually dictates a shortish focal length lens, or a mirror system.

Once the equipment is set up, the photography is quite straightforward. Normal metering methods can be used, but for complete control, especially with systems using flash, it is an advantage to have a camera to which a Polaroid back can be fitted. This allows you to check the effect, especially the relative light levels of subject and screen image, before shooting conventional film.

Projection gear

Front projection units (left) use semi-silvered mirrors to throw the image on to the subject. To ensure correct alignment, the camera lens is clamped in place. You can also get good results with simple equipment (right and below). In this case, the image was thrown on to black paper



on to a frame like a trampoline. If a full-length studio shot is set up, the floor in front of the screen may have to be built up to hide the frame.

Screens of this type can be expensive, but there are cheaper alternatives. 3M make a portable Polacoat twin screen unit which carries both front and rear projection screens snapped into a light-weight frame. Table top screens designed for audio-visual displays can

Darkroom

Bromoil printing

Oil and water do not mix, and this is the basis of bromoil printing—an old-time process which is capable of yielding exquisitely textured images from ordinary black and white negative originals



W. Whiting

Although the clarity and contrast of modern prints is clearly a great improvement on the prints of yesteryear, the soft, 'textured' images given by some old techniques can make very attractive pictures. One such method, the *bromoil* process, gives interesting, unusual pigmented prints which have a delicate and quaint appearance and character impossible to duplicate by any short-cut modern day process. Yet it is a straightforward printing technique, giving high quality 'art prints' for a minimum of expenditure. Using rollers, as here, instead of brushes for the inking stage greatly cuts the cost of materials.

Just three stages are involved—exposure, bleaching and inking a black and white print. And the inked image can actually be used to make transfer prints by passing the bromoil and paper sandwich through a simple press.

Printing the original

For a good bromoil print, the negative should be properly exposed but slightly soft since the process tends to increase contrast. If you choose a negative that is too contrasty there may be problems in the inking up stage.

Special 'art' surface photographic paper without supercoating is best for making bromoils—available from specialist suppliers, such as Kentmere. For various reasons, both normal fibre-based and RC paper are unsuitable.

The first stage of the bromoil process is to make a print that is darker than normal—give about 20 per cent extra exposure—and leave a large border for handling. You may find it worthwhile to burn-in highlight areas such as sky details to make them reproduce in the final image. Process the print in Kodak D-163 developer at 1+5 dilution. D-163 is

Landscape With its remarkable ability to combine sharpness with texture, the bromoil process offers a unique method of printing ordinary black and white negatives. Prints can be of any size, but have to be made on a suitable type of paper

particularly suitable as it leaves no stain in the highlights after pigmenting.

Transfer your print to a weak stop bath and then into plain non-hardening fixer for about 12 minutes. The plain fixer does not harden the gelatin. Wash your print for at least one hour and then dry it thoroughly. Proper fixing and washing are vital.

The bromoil sequence

Begin the bromoil sequence by soaking your print for at least ten minutes in tepid water. Next, transfer it to a tray containing a bleach-tanning solution.

One of a number of bleach-tanning formulae can be used. The most economical and readily available formula consists of a solution containing 30 g copper sulphate, 30 g potassium bromide, 15 g potassium dichromate (originally known as potassium bichromate), and 1 ml sulphuric acid. Add these to 300 ml of water, and then add water to make up to 500 ml of stock solution. Remember to add the acid to the existing mixture when preparing it.

This stock solution can be stored almost indefinitely in a brown glass bottle, with a tight glass stopper. It is diluted 1+3 for use, after which it is discarded. The temperature of the bath should be kept at about 20°C and the print is immersed in it for ten or more minutes to allow good penetration.

During bleaching, the silver image of the print disappears. Also, the gelatin is tanned in proportion to the density of silver that has been bleached. Areas with little or no exposure will only be partly hardened, whereas shadows (where there is more silver) will be rendered hard and insoluble. Unlike dye

transfer (see pages 1884 to 1889), the soft gelatin is not washed off in the bromoil process. The soft emulsion absorbs water and so is grease resistant to a degree, and will therefore repel any subsequent coating of oil-based pigment. The hardened areas, which do not repel pigment, are capable of printing an image. A similar process is used in modern lithographic printing.

After treating in the bleach bath, the print needs at least 15 minutes wash to remove the yellow dichromate stain. Give a longer wash rather than risk any contamination. Then immerse your print in a freshly mixed bath of plain fix for no longer than five minutes. If the print turns red at this stage the working strength bleach solution is contaminated by carry over, and should be discarded. Assuming all goes well, wash the bleached print—now called the *matrix*—for 30 minutes and dry it thoroughly. For convenience, you can prepare a number of matrices, dry them, and store in a dry dark cupboard until you are ready to pigment them. Matrices should be used within a month of preparation.

Pigmenting

Give the dry matrix a pre-soak for 20 minutes at 20°C so the soft gelatin absorbs water and repels grease more efficiently. While the matrix is soaking you can prepare a palette or two of ink. It is best to use very stiff, thick lithographic ink when adopting the 'proper' method using bromoil brushes. Slightly thinner letterpress ink can be used with a roller if you prefer this method of application.

The colour of the ink you use determines the colour of the bromoil image. A mixture of brown and black gives a nice 'old fashioned' effect—but other colours can be effective depending on the nature of the subject.

Start with a slightly thicker ink than you think you need—this can be thinned down, if it does not take to the matrix, by addition of one or two drops of suitable solvent on the palette. Ink that is too runny is difficult to apply but can be thickened by evaporation, helped by spreading it out on the palette. Or you can improve its consistency by mixing the ink with sun dried linseed oil and powder colour.

Making a bromoil print



1 Begin by producing a black and white print on suitable paper. Develop this in D-163, and aim for a slightly darker than normal image. Soak the print for bromoiling



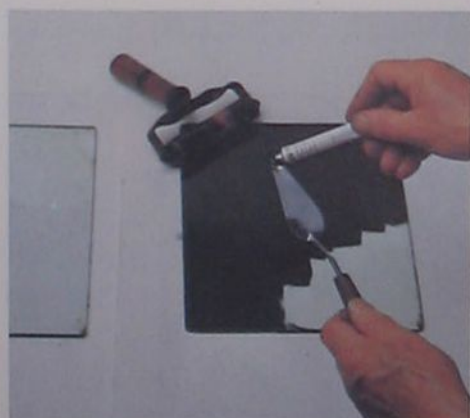
2 Transfer the damp print to a dish of bleach-tanning solution for ten or more minutes to allow good penetration of the chemicals and full image bleaching



3 Then place the bleach dish, with the print image uppermost, under a tap to wash the print clear of all traces of the yellow coloured bleach solution



4 After about fifteen minutes wash, immerse the print in a freshly mixed bath of plain fixer for no longer than five minutes, followed by a long wash



5 The pigmenting stage begins with the preparation of the inking palette—you can use a sheet of thick glass for this. Using a roller, spread the ink thinly



6 The bleached print—the matrix—should be stored in a dry dark place until needed for pigmenting. Then it is given a 20 minute presoak to prepare the gelatin

The ink should be at its thickest during the first applications to provide contrast and good shadows. Although the effect of thinner ink is very subtle, a relatively thin ink coating should be made in the later part of the pigment process to give highlight details. Once thin ink has been applied to the surface, harder ink will not take to it—use of too thin an ink consistency at the beginning will cause a flat muddy result without contrast or detail.

It is best to work with three palettes for the inking stage. These should be 15 cm square or larger—plate glass or ceramic tiles are ideal. Place a pea-sized quantity of ink on the first palette and use a small rubber roller to spread it into an even layer. Leave it for ten minutes.

Place some sheets of newspaper or blotting paper on the third palette and lay the matrix on this. Wet and wring dry a chamois leather and use this to wipe away any droplets on the gelatin surface of the matrix. If the roller picks up any water droplets they will interfere with the inking process and you will have to start again. Do not use blotting paper to

dry the matrix as it may overdry the print, as well as leaving lint.

Load the roller by making several 'passes' over the inked palette. Now pass the roller over the second palette to moderate the amount of ink the roller will deposit. The object is to build up the amount of pigment slowly and retain control of the process.

For inking up the matrix there are two basic actions for the roller. It should start and finish just outside the image area and be in one direction only, not an up and down or side to side movement. By working away from yourself you can see the results of each movement. The first is a straight action up the length of the print working your way across to cover all the image areas, with an even, moderate pressure. The second action is the same but in an up and down 'picking' manner so the length of each pass is perhaps only 5 cm or so long. This is to build up density in shadows more quickly but must be done with care. As you make each pass a quantity of ink is deposited on to the hardened gelatin of the matrix. After a few passes the roller will stop deposit-

ing ink and should be reloaded and moderated as before so that inking can recommence.

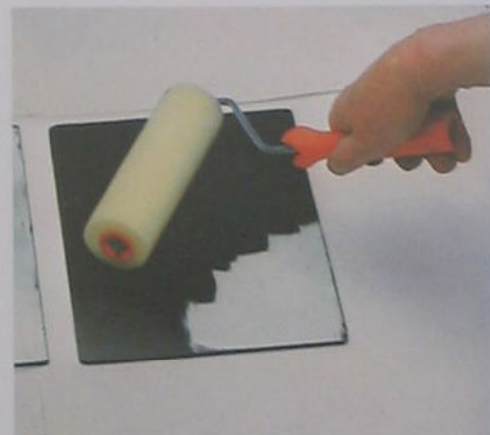
If the ink starts to creep in highlight areas that should be clear, then it may be removed up by running a clean dry soft roller across the matrix. The cause is either lack of moisture in the matrix or use of ink that is too thin.

If the matrix gelatin becomes too dry during pigmentation, the dry roller will not remove ink put on to the highlights. To correct this, dip a chamois in water and rewet the surface. Remove all droplets from the matrix with a second chamois, using a gentle patting action. As an alternative to swabbing you can carefully pick up the matrix and resoil it in a bath of tap water, then dry it with the chamois.

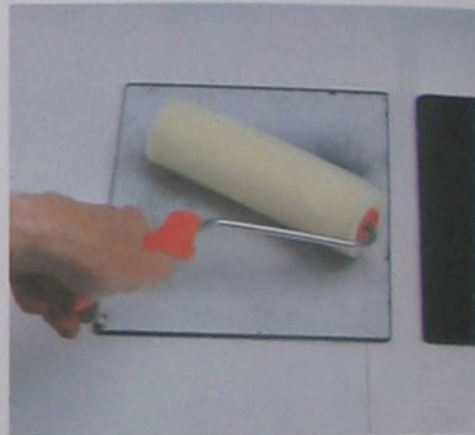
When you are satisfied with the density and appearance of the image you can dry it. Put drawing pins at each corner to prevent curling, and leave the bromoil in a warm (but not hot) clean, dust-free place for about two or three days. Try not to touch the surface or you might smudge it and do not attempt to accelerate the drying process using heat



7 Next, carefully put the matrix on a sheet of absorbent paper placed on a spare palette. Use a damp chamois leather or soft cloth to wipe away surface droplets



8 If you are using the roller application method, load the roller by making several 'passes' over the inked palette. Try to make the covering even



9 Now pass the roller over a second but clean palette to remove, or 'moderate' the amount of ink which is subsequently applied to the gelatin of the matrix



13 When you are satisfied with the image, carefully pat the print surface dry and pin the edges down to prevent curling. Leave the bromoil print to air dry



14 The original bromoil process employed brushes rather than a roller to apply pigment. These are very expensive though excellent for the job



15 When using a brush, several actions are needed. In the first, the 'toe' formed by the shaped bristles is kept in constant contact with the bromoil's surface

or the pigment may crack. Spotting can be done later using the same colour ink diluted with a little megilip (linseed oil and varnish) or watercolour. One attraction of the bromoil process is that if you are not satisfied with the result because it is too weak, you can re-ink it by repeating the pigment steps: this can be done even weeks later.

Cleaning up

It is very important to clean off any residual ink from the implements or they will have to be thrown away. Use white spirit or turps substitute to dissolve ink on the rollers and palettes, and follow this with a wash in hot water to which household detergent has been added.

Using brushes

The inking stage of the bromoil process was originally performed with special bromoil brushes which were extremely soft and fine, with a head shaped like a stag's foot or horse's hoof. Names like Mortimer hog's hair, and pole cat fitch, indicated the type of bristle, each offering different characteristics. It can

be difficult to obtain special bromoil brushes and they are quite expensive—they are made in the USA (see Inside Front Cover for address), but there is no better method for bromoil work.

Three brushing actions are associated with bromoiling. In the first, the 'toe' of the brush is kept in constant contact with the matrix surface and, using a springy, stippling action, the brush is dragged lightly and slowly over the face of the matrix. This action puts the most pigment down on to the matrix.

The second method is a similar stippling movement but the brush breaks contact with the surface and a vertical pouncing or snatching action is used. The third action involves holding the brush over an area and dropping it on to the matrix surface and catching it in mid-air as it bounces off. This is called *hopping* and if done correctly will remove ink put on to the area in previous passes using the first brush.

Bromoil transfer

When you have had some experience of straightforward bromoil printing, you

may like to attempt the transfer process. This works on the same principle as printing techniques in which a matrix is formed by greasy ink which is transferred to a sheet of paper, by contact and under pressure. Since modern papers are quite thin the image tends to break up on transfer, and you must be well practised with ordinary bromoils to be able to control the ink that is transferred during printing.

To start with, make a print in the normal way but expose the negative base upwards to give a laterally reversed image. When this matrix is printed by contact in the transfer step, the image orientation is corrected. The print needs to be slightly lighter than the one for ordinary bromoil work, and has to be about a half a grade more contrasty too.

The bromoil process is followed exactly as far as the pigment stages. If you have prepared a number of matrices in advance they should be res soaked in clean tap water for 20 minutes at 20°C.

Get three palettes ready and spread a small amount of ink in an even layer on the first. The ink may have to be mixed



10 Two basic actions can be used for applying pigment—a straight 'painting' motion, and a 'picking' one to build up density in shadows



11 After the application sequence, which ends when no more pigment is wanted, transfer the print to a dish of water. Highlights can then be cleared (see text)



12 Use a damp cloth or chamois leather to soak the surface, and another to pat it dry, in order to remove surplus ink in highlights and on borders



16 In the second of the actions employed in bromoil brushwork the contact area of the brush remains the same, but the brush is allowed to 'spring' from area to area



17 Another technique involves allowing the brush to drop on a selected spot and be momentarily caught, on rebounding, to fall again as part of a continuous cycle



18 After any bromoiling sequence it is important to clean off the equipment and utensils you have used, otherwise they will be ruined by the inks



W. Whiting

Ideal subjects Timeless subjects such as portraits, landscapes and pictures of buildings respond particularly well to the subtleties of the bromoil process

with powder and linseed oil to ensure that it has a firm consistency—if it is too thin it will not transfer properly, and instead will spread and make a mess.

Using the same sequence of actions as before for bromoil pigmentation, ink the matrix using the rubber roller. Then lay a spare piece of transfer paper on the top and sandwich them between two pieces of card that are larger than both. It is best to use smooth surface paper that has not been 'hot pressed' in manufacture otherwise it may disintegrate on application of the ink.

The next stage is to run the sandwich through to ink the matrix evenly. An old clothes wash wringer, or mangle, is a good substitute for the traditional bromoil transfer presses which were once made. Adjust the rollers to give uniform pressure and run the sandwich right through at a slow speed, and then back again. Do not stop midway or you may damage the matrix within. Then carefully separate the sandwich, pulling the matrix away from the transfer sheet by one corner.

The matrix now has a coating of ink pressed into it and is almost ready to be used for real transfers. The image on the contact sheet gives you an indication of the result and shows areas that may need extra inking or retouching later.

Resoak the matrix in water for a minute or two as it has probably dried out. Then put it on the palette, wipe it dry and carefully ink it up again. The secret is to

apply the ink lightly since any ink on a highlight will transfer completely because the gelatin does not retain it. Shadow areas retain ink so not all of it goes down on to the transfer. This results in a slight drop in final contrast. Also, you must avoid dust or hairs on the matrix as these will ruin the transfer. The matrix should appear bright and contrasty.

Prepare the sandwich again for rolling through the press. The transfer sheet should be underneath the matrix and much bigger. Run the sandwich through the press as you did before and lift off the top board of the sandwich. Carefully mark the corners of the matrix on the transfer sheet, using pencil. This will help re-alignment if you wish to re-ink the matrix further and repeat the transfer. This is only necessary if the transfer image is not satisfactory. Then peel the matrix off the transfer and inspect them both. If there are any areas of weakness, you can build up more density by repeating the transfer steps.

Bromotypes

The old Mediabrom Process was similar to bromoiling and has been updated to suit modern materials, it is known as Whiting's Bromotype Process after its creator.

It is a simple extension of bromoil work and involves redeveloping the silver image after it has been bleached and tanned. The final image has improved contrast, sharpness and depth.

Start by making a print less dense than you would need for a bromoil print. Now proceed with the bromotype process, as you did before, until the bleaching is completed. From here the steps change and you should not fix the matrix but instead, wash it for 20 minutes and then redevelop its image in D-163.

Then immerse the print for five minutes in a plain non-hardening fixer and give it a good half an hour's wash afterwards. You can pigment it once it has dried. The pigmentation is done in the same way as before, after a presoak.



W. Whiting

What went wrong?

Sport

Sports photography holds some of the most exciting action material, but it is not easy to capture this on film as sports photographer Nigel Snowden points out

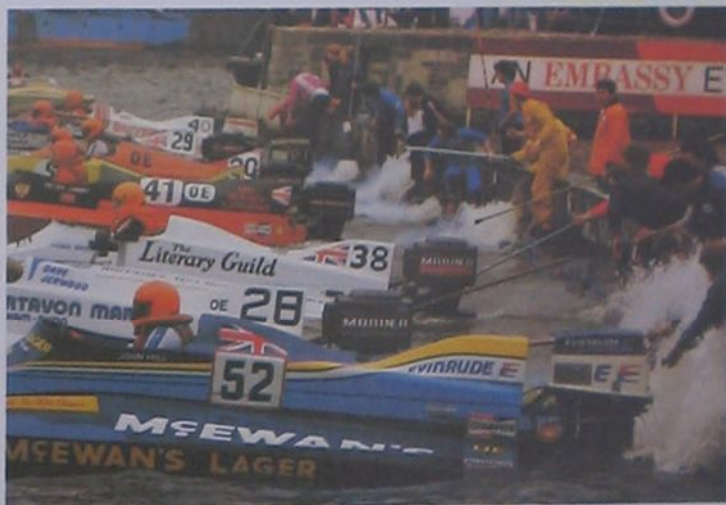


Three of the main ingredients for good sports photography are positioning, timing and a measure of luck. Although I like this picture, I do not think the photographer has made the most of this very exciting and photogenic subject. Probably the most popular and dramatic angle for shooting canoeing is the three-quarters front shot and although the photographer has tried something a little different, taken from this angle the canoe looks elongated and the composition has a stretched out appearance. Had I shot from this position, I would have chosen a longer focal length lens and concentrated on the two canoeists. This would have condensed the action and made the picture more dramatic.

An obvious fault in the composition of this picture is the long marker pole appearing out of the head of the second canoeist. The shot could have been improved by waiting until the front canoeist's face was unobscured by his arm thus showing more clearly the look of determination on his face. The photograph is well exposed and sharp and the dark band and highlighting of the white water make it a pleasing picture.

Powerboat racing has long been one of my favourite subjects for sports photography, and the Grand Prix series is one of my favourite events. There are numerous vantage points from which both the amateur and the professional photographer can take a great variety of shots.

In this picture the photographer has made a good attempt to capture all the colour and excitement of the start of a race. The picture is well exposed but somehow seems to lack a main focal point with the three points of interest—the drivers, the engines and the helpers—all well separated. I feel that had the photographer shot a fraction later, the boats would have been in a more interesting attitude with the propellers biting deeper into the water sending showers of spray over the helpers and thus drawing the separate elements of the picture closer together and creating more impact. As it is, the engine of the second boat is barely turning over. Perhaps a lens of a slightly shorter focal length or a more distant viewpoint that enabled the full length of at least one boat to be included in the picture might have improved the composition.



There are several ways in which a photographer can shoot athletics: straightforward reportage type pictures—the athlete breasting the tape, the differing styles of athletes, the look of triumph or despair on an athlete's face and so on—or there is the impressionistic approach where the action seems to leap out of the page. To do this, a zoom lens could be used to zoom during the exposure or perhaps, as this photographer has done, use a very slow shutter speed to give the impression of great speed.

I feel that in this picture, however, that the slow shutter has been slightly overdone. A faster shutter speed might have made the body and face of the runner slightly sharper while still allowing sufficient movement in the arms and legs to achieve the feeling of speed although there is always an element of 'hit and miss' in this type of shot. I think that the feet of the runner are an important part of the picture and should not have been cut off. Although the background colours are attractive, the overall effect is rather drab for such an animated subject.



82TR/LK





Anne Hickmott

Gum dichromate printing

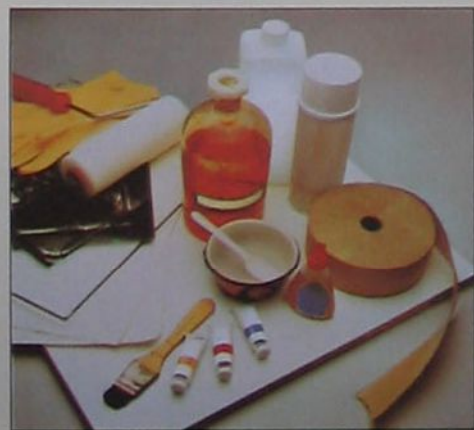
This interesting and inexpensive process—whereby gum, pigment and dichromate are coated on paper—can be used to print quaint period 'art' photographs like those made at the turn of the century

Like many old printing processes, gum dichromate printing is worth reviving if you are looking for something a little out of the ordinary in the darkroom. It is a simple, cheap and, above all, highly attractive way of making coloured prints.

Formerly known as bichromate printing, gum dichromate works by contact printing rather than enlarging, and the essence of the process is that gum, mixed with potassium dichromate, is coated on paper and hardened by exposure to very bright light. If you add a suitable pigment to the gum dichromate mixture, expose the 'print' to a continuous tone or high contrast negative image, then wash away unexposed unhardened image areas to 'develop' the image, the result is a coloured positive which has a soft, pastel appearance not unlike a chalk drawing.

You can use tinted papers for the base and virtually any colour or combination

Pub window *This is the same posterization as used for the step-by-step sequence shown overleaf, but different printing colours have been used. The materials needed for gum dichromate printing, shown below, are relatively cheap*



of colours for the print. It is possible to add areas of colour selectively to image areas, by recoating and re-exposing.

The paper base

You can coat the gum mixture on to any good quality paper support—in fact on to almost any grease-free prepared surface. But the texture of the paper greatly influences the nature and quality of the final image. So you should choose the paper to give the kind of finish you want. A smooth surfaced paper gives the finest detail, while a rough textured surface gives an 'original' look. Choose as tough a paper as possible because this stands handling in the wet state and dries without buckling. Very porous papers may be used but they require heavy sizing—preparation of the surface to prevent both the excessive absorption of pigment and staining. Small pieces of different papers can be tested for wet

Tim Stephens

strength, pigment absorption and whether or not they return to original size when dried.

Preparing the paper

The paper must be at least 30 mm to 60 mm wider than the image, to allow for handling and subsequent trimming. If you want very large borders, it may need to be even wider. If the paper for printing is likely to stretch a great deal, pre-stretch it by soaking in hot water for up to 15 minutes. Blot and stretch it on a sheet of hardboard with smooth side uppermost. Pin down round all four edges to discourage buckling and leave the paper to dry.

Next, the paper is given a sizing coat. Any household spray starch can be used. You can mix a ten per cent solution of powdered gelatin instead. But this solution does not keep for more than a couple of days and is not so easy to apply evenly as the spray starch. PVA material such as used with acrylic paint is a third possibility. Use any sizing sparingly because too much creates difficulties at the coating stage.

Leave the paper pinned to the hardboard sheet, spray or paint on the sizing evenly, and leave it to dry. Several sheets of paper can be prepared at this stage and stored, stretched, on the hardboard backing until after coating.

Mixing the emulsion

Start by preparing two stock solutions. The first, a gum arabic solution, can only be stored for about a week, even when refrigerated, so only mix as much as you need. This solution is made in the proportions: 350 g powdered gum arabic to one litre of hot water. As little as a tenth of this would, however, be adequate for several small prints when mixed with the corresponding amount of the dichromate solution (see below). A commercial gum for office use is a worthwhile alternative to mixing a standard



Classic nude Early example of a gum dichromate print, made around 1900. The process was particularly popular in Europe, and Demachy was one of its principal exponents (see page 1504). **Hand colouring** Gum dichromate prints can be coloured by hand using retouching dyes, watercolour or gouache pigments after the printing procedure has been completed

gum arabic solution, since it is both more stable and consistent. Golden Gum is one of the proprietary brands widely available.

The second stock solution consists of a ten per cent solution of either potassium dichromate or ammonium dichromate. Ammonium dichromate is more light sensitive than potassium dichromate and needs about half the exposure.

Make up a stock of dichromate solution by dissolving 50 g of dichromate crystals in 500 ml of warm water. This is a saturated solution—you know the strength is right if a few undissolved crystals remain after mixing. Store the solution in a dark bottle as it loses some of its properties if exposed to daylight.

The third ingredient of the gum dichromate emulsion is a suitable pigment. Watercolour or gouache paint in tubes are the easiest to use, and mix well with the other ingredients when the emulsion components are combined. Powder colour is an alternative, but is rather more difficult to mix in. Almost any colour can be used but the earth pigments such as cadmium yellow, burnt sienna, ivory, lamp black, burnt umber, prussian blue and venetian red are among those that seem to give the best results. Always use the best quality pigments you can afford as these are free from impurities—remember, a little can go a long way.

Prepare the emulsion in subdued lighting. Mix equal parts of the gum and dichromate solutions, and to roughly every four parts of this mixture, add one part pigment. A 5 ml spoonful of each stock solution, with a quarter spoonful of pigment, should be sufficient for one or two A4 prints. The correct proportion of pigment has to be established by trial.

It is usually simpler to mix the pigment with the dichromate solution first, stirring until it is uniform. Then stir in the gum until this too is thoroughly mixed. Do not be dismayed by the yellow colour of the

Robert Demachy/Société Française de Photographie/fotogram



Making a gum dichromate print



1 Gum dichromate mixture can be used on any good quality paper. If it is likely to stretch, prestretch it by soaking it in hot water and pin it down



2 Tape the damp paper to a workboard using gumstrip. Leave the paper to dry. Use a hairdryer to speed drying. Then size the paper using any household spray starch



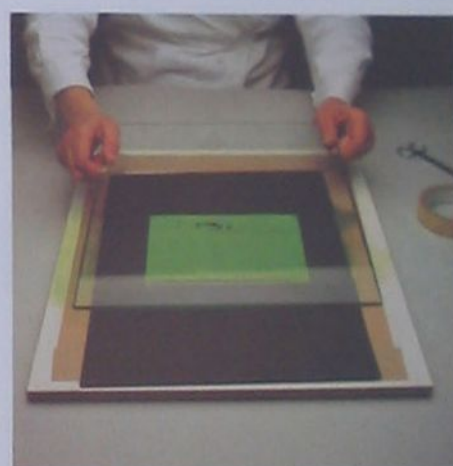
3 Mix up the mucilage by adding gum arabic to a premix of 10% dichromate solution and pigment of your choice. Then pour a little on to the print paper



4 Spread the coloured mucilage evenly. A roller gives the most even coating but suitable brushes may be used to obtain a brushwork textured effect



5 When the gum mixture has dried, position the separation negative you are using for the first colour or image in contact with the prepared paper, and tape it down



6 To 'print' the border, use an opaque mask cut from a sheet of thick cartridge paper. Finally, weigh down the sandwich with a sheet of clean glass



7 Use an adjustable lamp fitted with a bulb high in UV output to make the fairly long exposure. The duration can be found by making test prints, noting lamp height



8 Carefully dismantle the exposure sandwich. Some sort of latent image should be visible if the exposure has been made correctly and for the right time



9 Soak the paper in a dish of fairly cool water, face downwards, for about ten minutes. Carefully remove the gumstrip, and handle the print only by its edges



10 Carefully turn the print face upwards. Unexposed, and thus unhardened, parts of the image should have begun to wash clear but stubborn areas can be gently hosed



11 Dry the print. If another colour, tone or image is to be added, the paper must be sized again and recoated on each occasion, then taped to a workboard as before



12 Position and tape down the second image separation registering the two images as you go. Complete the sandwich as before and make the next exposure



13 Develop the image as before, hosing down gently if necessary. Warmer water and gentle brushing can be used to encourage the removal of obstinate parts



14 Here, a third colour has been added. The same separation can be used for printing a completely different set of colours—such as for the lead picture (page 2201)



15 Finally, immerse the print in the 'fix' solution which consists of a 5% solution of sodium metabisulphite. This removes the yellow dichromate stain. Then dry the print

dichromate, which may overpower the pigment colour, as this will disappear after processing. This emulsion, known as *mucilage* (a solution of gum), does not keep and should not be stored, so only prepare as much as you need.

Coating the paper

Coating is a critical part of the process and you must be extremely careful to ensure that the coat is even and not too thick. For the most consistent results, apply the mucilage using a latex foam roller. Spraying and brushing are other methods—brush strokes can look particularly attractive as they become an integral part of the image. You do not have to coat the paper in the darkroom; you can work almost anywhere out of direct sunlight, since the coating is not fully sensitized until dry.

If you use a roller, 'ink' it up with the mucilage by placing a small amount on a sheet of glass or plastic, and running the roller over it. If necessary, thin the mucilage load by running the roller over another sheet of glass or plastic. Then coat the sized paper—rolling as thinly and as evenly as possible. Leave the paper to dry in dim light.

For brushwork, it is best to use a 60 mm wide brush, adopting a criss-cross stroke pattern. Brush marks can be accentuated using a slightly narrower and stiffer brush. If you do not want the textured appearance this gives, go over it again with a dry roller. If you do want brush marks or textures, apply the mixture unevenly, taking care that the coating is not too thick—otherwise the image could float off when developed.

Once the paper is coated it should be dried in a dark room or cupboard and exposed as soon as possible after drying. A fan heater or hair dryer can be used to speed up the process. But avoid over heating or the print may be fogged.

Exposing the print

You can expose the sensitized paper when it is dry. Contact printing methods are used, so you will need large size negatives, an exposing light and a printing frame—or a heavy sheet of glass and a sponge backing.

Ideally the negative should have a fair amount of contrast—a line original is ideal. Printing in different colours using line separations suitable for posterization is very effective. Enlargement copies made from colour transparencies and panchromatic or separation negative film also give excellent results.

To make an exposure, simply place the gum dichromate paper firmly in contact with the negative, emulsion to emulsion and expose this sandwich to a very bright light. Although you can make use of bright, indirect sunlight, the variable intensity of sunlight makes exposures unpredictable. Direct sunlight produces flat results. Use a UV lamp or QI lamp (Quartz Iodine)—such as that in a projector—so that lamp distance and exposure times can be noted, and used as the basis for similar exposures in the

Needleworker The structure of the image is considerably influenced by the choice of paper used for the gum dichromate print. Fine textured handmade paper was used here as well as a precoated base of white gouache, or watercolour

future. A lamp rig or stand is useful.

Exposure times vary according to the light source, the coating thickness of the mucilage, the pigment used and the base material (paper) structure. If you are as consistent as possible with all preparation stages, it is possible to have some rough idea of the exposure to stage future tests—but do take notes of all your experiments. As a guide, a UV lamp of 125 watts held a metre above the sandwich would have to be switched on for about 15 minutes to make an exposure.

During exposure the image 'prints out', becoming visible. When all the highlight detail is clear, exposure is complete. By carefully peeling back one corner of the sandwich in a contact printer, you may be able to check the course of exposure from time to time—but you need an old-type hinged frame for this.

If several exposures are to be made on the same print, it is necessary to have some form of registration so that all exposures will be in the correct position. A simple method is to indicate the image area by pencil marks on the handling borders of the print—just align each image with these. A commercial punch register system is best but a home-made version may prove adequate. Alternatively, register the images visually.

Development

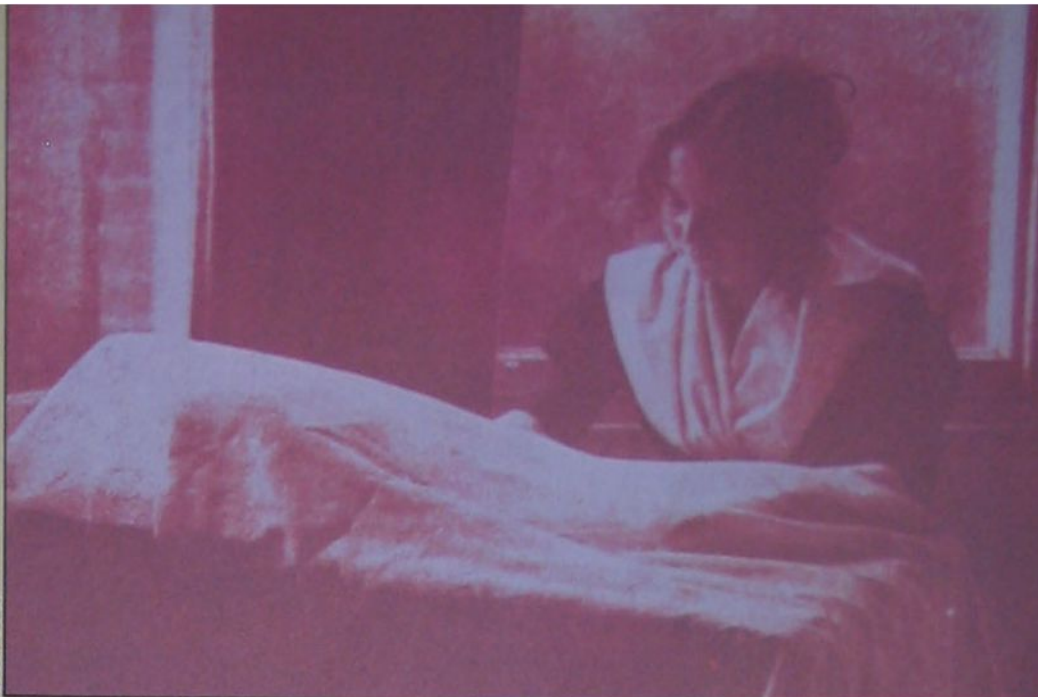
Development should be carried out immediately after exposure and may be done in subdued daylight or roomlight. Wash the print in several changes of water at room temperature and then leave it floating face down in a dish of water. Inspect the print after about ten minutes, taking great care to handle the print by its edges only—avoid touching the surface at all costs. If the exposure is correct, the unexposed and so unhardened gum in the highlight areas should wash clear. A small, soft brush can be used to encourage these to clear. Place the print face up on an upright sheet of glass or plastic and very gently spray it with cold water until the full tonal range appears and no further pigment drains off. Development is then complete.

Complete development may take several hours unless encouraged by hosing down—but it all depends on the density you require. If the print is too light, it is underexposed. If it is too dense, the exposure has been too long. Sometimes the use of warm—but not

Street Fine detail can be preserved. This gum dichromate print was exposed to a tone-line negative.

Chairs The abstract effect is considerably heightened by using coarse textured handmade paper. The original was a colour slide

Susan De Bari



hot—water will help to remove and clear dense prints. Leave the print to dry by hanging it up, or lay it flat on blotting paper. Do not touch the surface of the print while it remains wet.

'Fixing'

At this stage the print still has a residue of yellow dichromate stain and this can be cleared by immersing it in a five per cent solution of sodium metabisulphite. Do not use ordinary fixer solution.

Finally, wash the print in running cold water for a few minutes and pin it on to a board to dry.

Multiple exposures

It is usual to size, coat, expose and develop several times to achieve darker tones or adequate shadow detail—or to add a different image or colour. This means you can use the thinnest possible coating, to stop the pigment washing away during the development washing stage. Five printings for a darkly toned image are not unusual. The second and subsequent exposures must be shorter

so that only shadow detail is exposed. As a result, the first exposure appears rather flat and lacking in contrast.

It may seem that the process is extremely lengthy when compared to other forms of printing. But several prints can be made at the same time, some being exposed or processed, others dried.

Special effects

As the mucilage is applied by brush or roller and usually covers a larger area than the negative, the print will have an extended border. If this is not required, a black paper mask should be cut out to the correct size and placed around the negatives during exposure.

Local modifications of tones are possible during the development by brushing or spraying selected areas only. Stiff paint brushes will scratch the pigment—an effect only desirable if it is intended. Localized areas of colour can be laid on and given separate exposures. Finally, small blemishes can be corrected by careful spotting techniques using the mucilage you have prepared.

Anne Hickmott



Anne Hickmott



Enlarger light sources

The light source in an enlarger is much more than just a light bulb. To give the bright, even illumination needed for perfectly exposed prints, the light must be either focused precisely or properly diffused—or both

In the early days of photography, the light source for printmaking was the sun. But in the modern darkroom, the light source in the enlarger is an elaborate arrangement of lamps and lenses designed to provide efficient and even illumination to project a small negative up to a large, clear printing image.

Enlarger lights must provide illumination which is sufficiently bright to prevent unduly long exposures even at small apertures and sufficiently even to ensure that every part of the image receives the correct amount of light—otherwise, prints will be patchy, with some areas overexposed and some underexposed. This is slightly harder to achieve than you might think. But there are two main solutions: diffuser enlargers and condenser enlargers.

Diffuser enlargers

Clearly, a spot light source does not give even illumination: it would illuminate the centre of the image much more brightly than the edges. The simplest solution is to place an opal or ground glass screen between a normal tungsten lamp and the negative. The ground glass screen serves to scatter light in all directions and give even, diffuse lighting.

While this illumination is adequate for small negatives, large negatives need a larger lamp. But a larger lamp might create a bright spot in the centre. One solution is to use a bulb silvered at the top so that the screen is illuminated only by reflected light. Another is to use indirect lighting. In this, the bulbs are

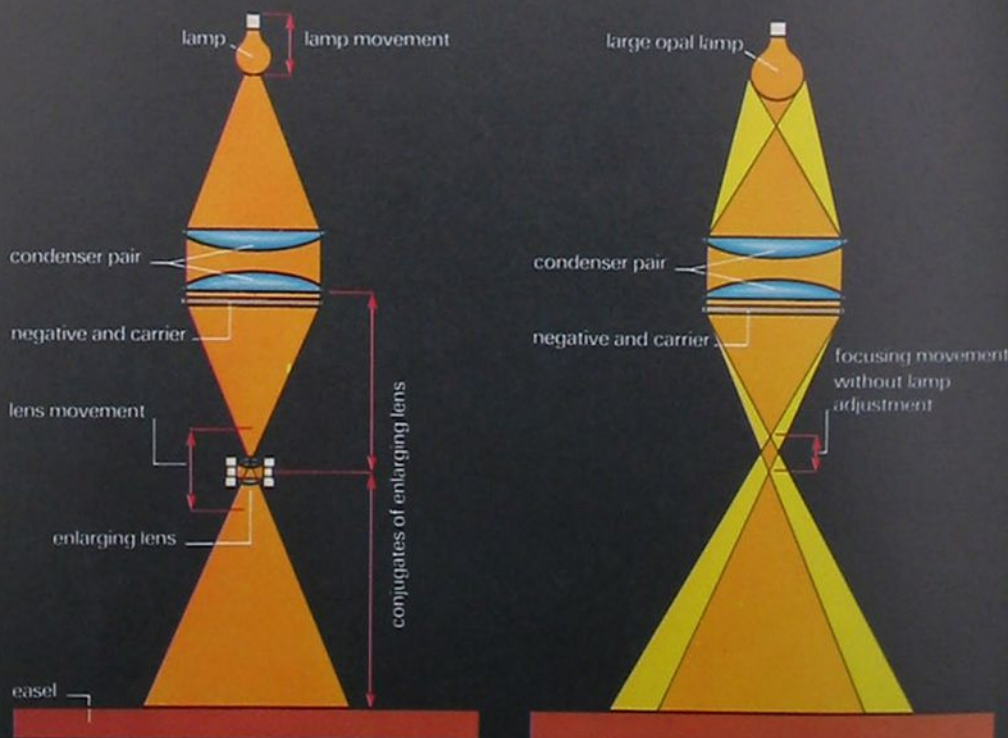
set either side of the screen and the light is reflected on to the screen from a matt diffusing surface above.

The problem with this diffuser system is that only a small proportion of the light from the lamp is transmitted through the screen and negative, and of this only a proportion passes through the lens. As a result, only a small percentage of the enlarger light reaches the print. With this kind of system, therefore, to illumin-

ate a large negative or to make a big enlargement, the light would have to be so powerful that it would quickly become very hot.

Because of this problem, some enlargers designed for large negatives use cold cathode fluorescent tubes. The tube is folded to form a grid providing a large, even bright light source that produces very little heat. The cold cathode tube takes up very little room and is very efficient, using little power.

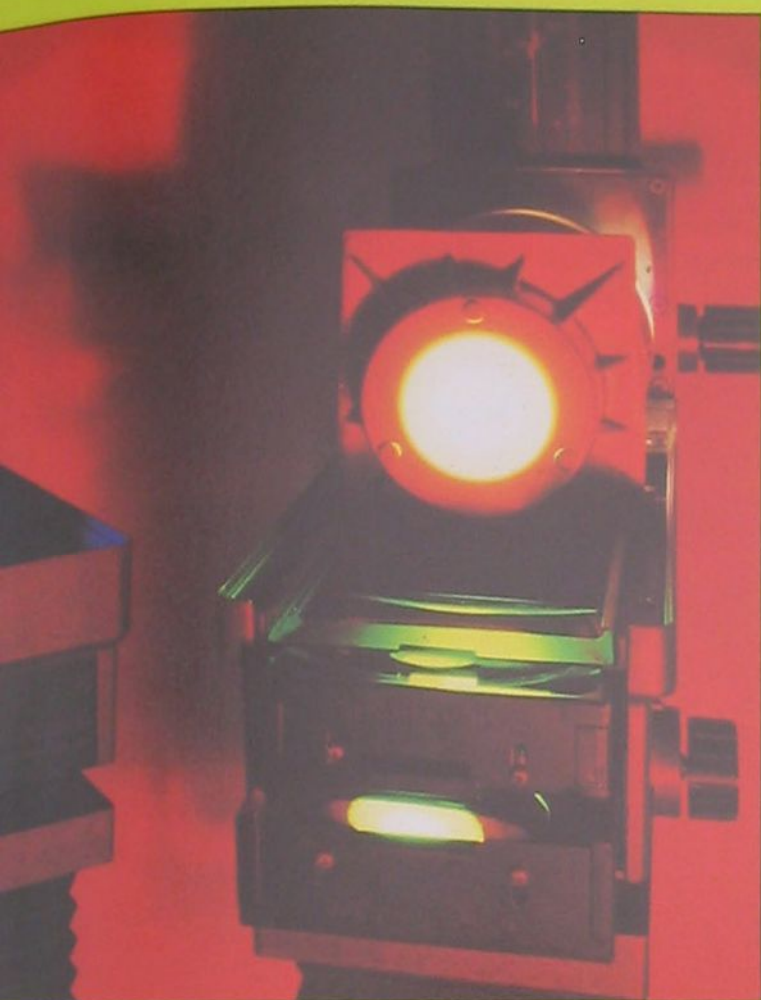
Condenser enlargers



True condenser enlargers give brilliant illumination, but the distances between the components must be reset for different enlargements to keep the light in focus

Condenser-diffuser To avoid the need for constant refocusing, most condenser enlargers use an opal bulb and ground glass screen to diffuse the light slightly





Condenser enlargers

Because of all the wasted light, diffuser enlargers are very inefficient. Condenser enlargers use a specially large converging lens (the *condenser*)—just larger than the negative—to funnel the light from the light source through the negative on to the lens. This means that a very high proportion of the light from the lamp actually provides useful illumination. Consequently, condenser enlargers are much better for big enlargements.

Because the condenser light source is effectively a 'spot' or specular light source, it has different effects on the various densities of the negative. The Callier effect (see page 2185) comes into play. Dense areas of the negative scatter the light very effectively and so little light reaches the lens. As density decreases, scattering is less and so more light gets through. In clear areas, there is virtually no scatter at

all and these areas are 'condenser brilliant'. With diffuse enlarging, all the light is scattered and contrast is similar to contact printing. With a condenser enlarger, contrast is increased.

It may be thought that the enhanced contrast of a condenser enlarger is an advantage. More usually, though, it is a nuisance, because it emphasizes all the blemishes, scratches and fingermarks on the negative. Consequently, it cannot be used with negatives that have been retouched, since all the retouching marks show up.

A second drawback of the condenser system is that for good illumination with a small source, this must be focused precisely on the lens. This is inconvenient because every time the lens is moved, the lamp and condenser must be refocused.

Condenser-diffusers

A compromise is achieved by using an opal, diffusing bulb with a condenser designed to focus the light not to a point but as a disc. The result is that although a little brightness is lost, the lens can be moved up and down quite some way without the lamp needing to be refocused. Only when the lens is moved a long way must the lamp focus be adjusted.

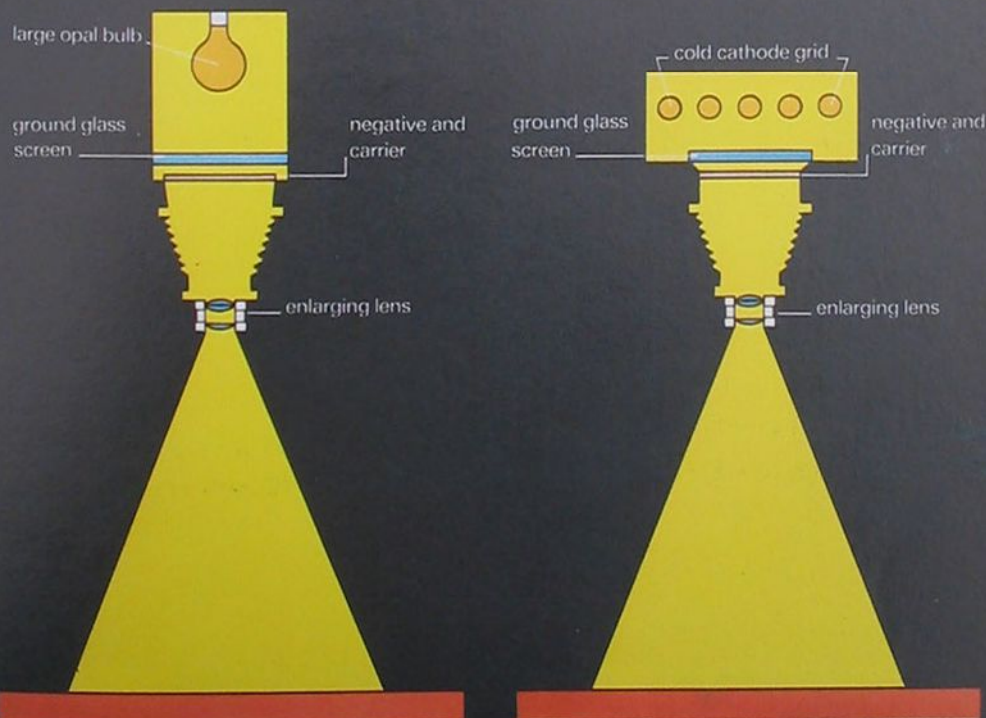
In some condenser-diffuser enlargers, a ground glass diffusing screen is inserted between the condenser and the negative to allow large lens movements without refocusing. The light loss is considerable and exposures are longer, but the condenser means that the light scatter from the diffusing screen is mainly towards the lens and so illumination is still higher than with a diffuser enlarger. If the negative is to be lit evenly, though, the condenser must be even larger than the negative.

Because they give a light source bright enough for big enlargements without the need for unduly long exposures or constant refocusing of the lamp, the condenser and opal lamp type of enlarger are by far the most popular. But true condensers remain useful for commercial labs where speed is of the essence and diffuser enlargers may be better when the negative has been heavily retouched.

Tessa Musgrave

Enlarger light sources have become more and more sophisticated over the years but even colour enlargers work on the same basic principles

Diffuser enlargers



Simple diffuser Although exposures are long, a diffuse light source never needs refocusing and does not show up heavy retouching marks or other blemishes

Cold cathode tube enlarger give a diffuse light bright enough for big enlargements but do not overheat as a conventional bulb might



Equipment file

Big cats

The increase in popularity of mirror lenses over recent years owes much to reductions in their size and cost, bringing within the scope of the amateur those exotic wildlife and sports shots that previously only professionals could take



These Bergstrom lenses courtesy of Eumig (UK) Ltd, Photax (London) Ltd & Astro-Systems Ltd

If you want a lens with a very long focal length, but are put off by the sheer size and cost of a telephoto, it may be worth considering a mirror lens. By 'folding' light with mirrors, these lenses give the same focal length as a telephoto in a much shorter barrel. And because they

use mirrors rather than bulky, precision ground glass refracting elements, they tend to be lighter and cheaper.

There are a number of variations in design, but all modern mirror lenses are *catadioptric*—that is, they include a number of glass refracting elements as

Compactness and low cost are the main advantages of modern mirror lenses. The large lens, here, is a reflecting telescope—these work well as 'mirror' lenses. Long and short The difference in length of a 400 mm telephoto and a 400 mm mirror lens is very significant

well as mirrors. And as a result they are often referred to as 'cats'. Japanese manufacturers have tended to concentrate on the Mangin mirror type, using rear silvered glass elements. This is ideal for very compact, close focusing lenses. European manufacturers such as Zeiss, on the other hand, concentrate more on lenses working on the Bouwers-Maksutov principle, using a large meniscus correcting element at the front. These cannot be made nearly as cheaply, but give better results (see page 1858).

Although the range is now beginning to expand, particularly at the cheaper end of the market, the choice of mirror lenses remains limited compared with telephotos. At present, there are fewer than 30 different mirror lenses on the market, and these are restricted to a few focal lengths. Mirror lenses tend to be made only at focal lengths of 300, 500, 1000 and 2000 mm. There are exceptions (such as the Sunagor range), but if you want an intermediate focal length—400 mm, say,—you will probably have to buy a telephoto. Indeed, only at 500 mm is there a wide range to choose from.

Nevertheless, the choice of alternative focal lengths is quite adequate for most people, and the compactness and low cost of mirror lenses may more than make up for the lack of choice.

Weight and cost savings

The savings in size and cost vary both with the focal length, and from manufacturer to manufacturer. Many of the independents have concentrated largely on the 300 and 500 mm lengths and aimed to produce extremely small, low cost lenses. A 300 mm mirror lens from one of the independents is only a little larger than a typical standard lens and is much the same price. The Ohnar 300 mm mirror, for instance, is just 67 mm long and 70 mm in diameter. Even a lightweight telephoto typically weighs twice as much and is two or three times as long.

The systems manufacturers have adopted a slightly different policy and none produce a 300 mm. Even their 500 mm lenses are not usually as small as the independents'. The Nikon 500 mm mirror, for instance, at one kilogram weighs almost twice as much as some of the cheaper mirrors. However, this extra

weight (and cost) is usually a reflection of better quality, and the savings in weight and cost over comparable telephotos is still considerable. Further up the range (1000 mm and longer), the savings can be even more significant. A 1000 mm mirror, for instance, is relatively easy to carry around, typically only 250 mm long and weighing under two kilograms; a 1000 mm telephoto may be three times as long and weigh twice as much. Again, such mirrors tend to cost half as much as a comparable telephoto.

Clearly then, if your only concern is compactness and cost, mirrors win out over telephotos at all focal lengths. However, mirror lenses have a number of other characteristics that may, ultimately, prove to be significant drawbacks.

Aperture

One of the most obvious differences between mirror lenses and telephotos in use is the mirror's lack of an aperture diaphragm. This means that the *f*-number is fixed by the diameter of the front element. Only one very expensive specialist mirror lens has an aperture diaphragm. The size of the fixed *f*-



number varies with the focal length. 300 mm mirrors are often $f/5.6$, while 500 mm mirrors are usually $f/8$ and 1000 mm mirrors $f/11$. Zeiss make a pair of faster lenses—a 500 mm $f/4.5$ and a 1000 mm $f/5.6$ —but these are incredibly expensive, the 1000 mm costing more than a luxury sports car.

Because of the fixed aperture, exposure must be controlled largely by varying the shutter speed. While shutter priority cameras will still work automatically with a mirror lens fitted, aperture priority cameras must be operated manually. Normally, you have no choice over shutter speed: it is dictated by the lighting conditions. You can alter exposure by using neutral density filters to reduce the effective aperture. Most mirror lenses come with a pair of neutral density filters, but if they are not supplied, ND filters for a lens which only accepts giant front-mounted filters may almost cancel the saving.

The fixed aperture is a significant disadvantage in many respects. Most importantly, perhaps, mirrors are very slow lenses. Indeed, the central obstruction blocks out some of the light passing through the lens and means that the effective aperture is actually up to a full stop less than the nominal rating.

This reduces the usability of the lens significantly. With a nominal aperture of $f/8$ and an effective aperture of $f/11$, a 500 mm mirror must be used with a fairly slow shutter speed in all but the brightest conditions. This means that you will very rarely be able to hand hold a 500 mm mirror—even in bright sunshine you need fast 400 ASA (ISO) film to allow the 1/1000 second necessary for hand holding. The mirror's portability becomes less important when you have to carry a full-size tripod around all the time to support it properly.

The slow speed of the mirror also means that the focusing screen is very

dim. Not only will you have difficulty seeing the subject clearly, particularly with the very long lenses, but you will not be able to use the microprism or split image for focusing, since most black out at apertures of less than $f/5.6$. So unless you can fit a ground glass focusing screen to your camera you may find it quite difficult to focus a long mirror lens.

Fixed aperture also means problems with depth of field. On long lenses, depth of field is restricted anyway, but with a mirror lens you cannot stop down to give the maximum possible depth. Indeed, even at the same f -stop, a mirror lens has less depth of field than a telephoto. This is because the central obstruction results in a disc of confusion (see page 30) which is actually a ring. Unfortunately, the eye can detect an out of focus ring easier than it can a disc.

A number of mirror lenses are now being marketed with special close focusing ability. Indeed most mirror lenses can focus closer than a comparable telephoto. The 400 mm Sigma, for instance, focuses down to as close as two metres to frame an area only 0.3 metres wide. But at this distance, the depth of field is extremely limited—probably little more than 3 mm—so you will only rarely be able to take advantage of this close focusing ability. The only advantage of the mirror's limited depth of field is that it compensates, to a small degree, for the darkness of the image when focusing. The image 'snaps' in and out of focus more noticeably.

Optics

Optically, the big advantage of mirror lenses is their freedom from chromatic and spherical aberration (see page 906). Long telephotos must incorporate bulky and expensive correcting elements. Unfortunately, this advantage is outweighed in other respects.

First of all, because of the ring-like

disc of confusion, resolution is limited. Second, high flare level and low contrast, problems in all long lenses, are particularly marked in mirror lenses. And third, mirror lens images suffer from a hot spot in the middle whereas with most telephotos illumination is even.

With good quality mirror lenses, the quality of results is usually acceptable though not as good as with a good telephoto.

Telescope mirrors

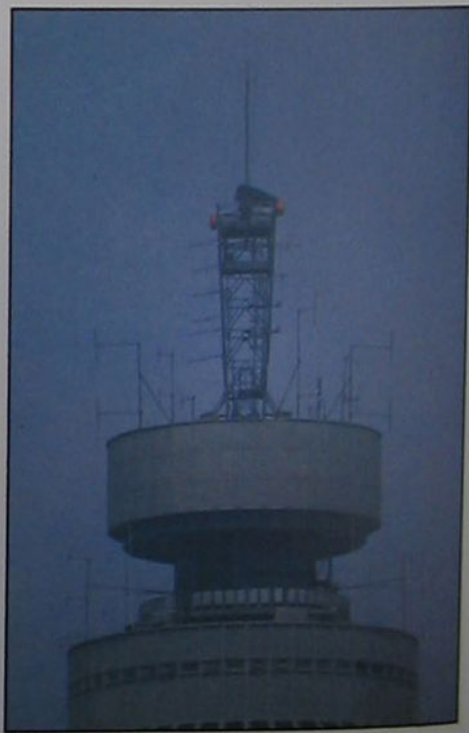
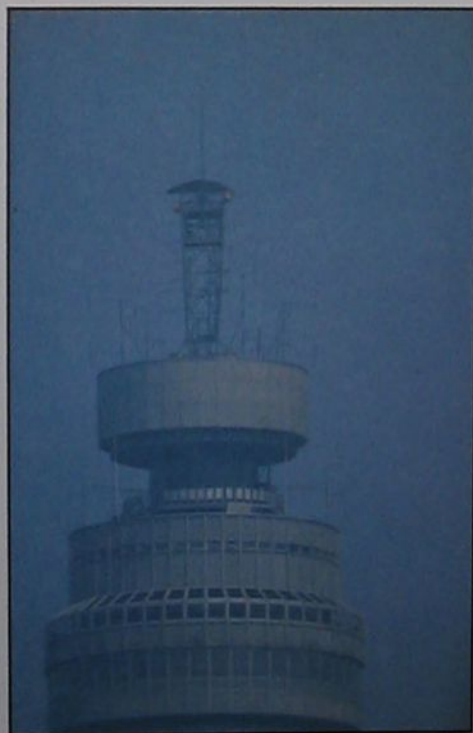
A number of mirror lenses on the market are made not by lens manufacturers but by telescope makers. The Schmidt-Cassegrain mirror lens design was originally intended for astronomical use, and the design is very popular as a comparatively portable telescope. The demand for such telescopes is quite high, so mass production has brought costs down.

An image which is to be viewed using an eyepiece at high power must be of very high quality, and a good telescope is more than adequate for photography. In addition, you can attach a wide range of purpose designed accessories to allow you to use the telescope by day or by night. The telescopes invariably use T2 mounts which allow virtually any make of camera to be used.

Conclusions

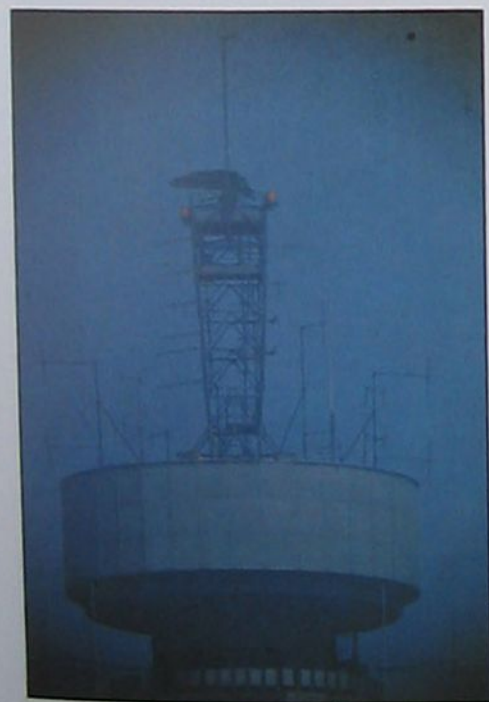
Mirror lenses of up to 500 mm focal length have applications in everyday photography, and are compact enough to be carried around when one might leave the equivalent refracting lens at home, though the mirror lens quality is noticeably worse.

Above 500 mm, mirror lenses come into their own, but the difficulty of using them tends to make them worthwhile only if you have a specific use in mind. However, as prices steadily drop many more amateurs may find a use for them.





Theo Bergstrom/lens courtesy of Astro Systems Ltd., Luton



Extra long focus The 2000 mm Celestron 8 is a relatively inexpensive astronomical telescope through which details of the moon and planets or even distant nebulae can be viewed with outstanding clarity and at reasonable magnification. Fitted to a 35 mm SLR via a T-adaptor and an inverter, to erect the image, such a set-up can be used for astronomical as well as terrestrial subjects, such as wildlife, sports and architectural details

Typical focal lengths Mirror lenses are available most commonly in focal lengths of 300, 500, 1000 and 2000 mm. The greatest choice is offered in 500 mm, whereas there are remarkably few in intermediate focal lengths, such as 400 mm. The shots from left to right were taken from the same rooftop location on a hot, hazy day, using a 350 mm mirror lens and telescopes of 750, 1000, 1250 and 2000 mm focal length. For all these shots the use of a tripod was essential as even locating the subject is difficult when hand-holding the bigger models. The 2000 mm telescope gave fair results, despite unavoidable vibration

World of photography

Fritz von der Schulenburg



Attention to lighting and detail coupled with an enormous enthusiasm for his work have given Fritz von der Schulenburg the chance to travel on assignment photographing interiors and exteriors all over the world

Photographing interiors may sound rather a dull activity—until you meet the London-based German photographer Fritz von der Schulenburg. Immediately, you are struck by the way he throws himself into his work. Indeed, it is impossible not to get carried away by his enthusiasm and his evident delight in showing his photographs.

Von der Schulenburg's love of photography started when he was given a Brownie camera for his sixth birthday. But for many years his passion was largely a hobby—for 16 years after leaving college in Munich he worked as an art director in advertising.

As an art director, von der Schulenburg worked in a number of places, but the period that he most enjoyed was working for the advertising agency, Collett, Dickinson and Pearce in England. 'CDP was a very revolutionary agency and was, in those days, the most creative agency in Europe. It did all the Benson and Hedges' cigarette adverts—really remarkable work'.

Naturally he came into constant contact with photographers while working in advertising and, from time to time, he directed photographers of the calibre of Avedon, Donovan and Duffy. The

Rambagh Palace Hotel, India Shot at dusk using a long exposure to capture both the sunset and the warm glow of the lights

experience was invaluable to him, both technically and visually.

During his time as an art director he continued to take photographs and often sold his work to magazines. Eventually his passion for photography overtook him and he decided to work as a freelance art director so that he could spend more time doing freelance photographic jobs. At first, these were largely in advertising but in the end he decided that his real interest lay outside advertising and in editorial photography.

Making the change from advertising to editorial photography involved a great deal of hard work for little reward, but after two years he had gained the recognition he sought—and the interesting commissions.

Nowadays most of von der Schulenburg's work is confined to interiors and exteriors and over 70 per cent of it is editorial photography. However, he still does some advertising work. This is usually studio photography—like photographing a new range of kitchen furniture. However,

although this is definitely the more lucrative end of the market, he still prefers the freedom of editorial photography where he has far more scope to create a particular mood.

Nevertheless, his experience in advertising is undoubtedly valuable in helping him to successfully assess and dress an interior—adding the little details that create the right atmosphere. Sometimes it is simply a question of placing a glass of Martini in the right spot or adding flowers. At other times, von der Schulenburg must create an environment almost from scratch. For example, while on assignment to photograph a palace in India, he discovered a marvellous railway carriage—a relic of the time of the British Raj—lined with mellow wood panels. But the furniture was out of place. By carefully rearranging the seats and covering them with rugs von der Schulenburg created a suitable nostalgic mood.

It is always the little unnoticed details that are the key to a successful interior shot. 'On location you often have to vacuum carpets, pick fluff from sheepskin rugs and polish furniture. If there's a fire in the room, it should be lit. If it's a dining room you light the candles and

possibly have the first course on the table. I did a shot in the Dorchester Hotel in London and the chef created a still life food dish to put in the foreground even though the main subject was the restaurant in the background. Details like this give life to interior shots.

Unlike in advertising, where an interior shot is usually mocked up, location photography provides von der Schulenburg with constant challenges. Even once he has decided on potential camera angles and dressed the interior—straightening props and curtains to perfection—he must check for details such as wanted or unwanted reflections in mirrors or pictures. If necessary, he polishes reflective surfaces or he may spray them matt. But it is the lighting that confronts him with most problems.

Once the details are seen to, lighting is von der Schulenburg's prime concern. Although it is clearly important to light the room well enough to show details, it is equally important to retain the feel of the natural lighting. 'I think the fault with a lot of interior photography is over-lighting—the result is very unnatural. The important thing is to balance the lights so it looks right—and that can be difficult.' The problems are most acute when photographing in mixed light situations, where there is daylight from windows and tungsten light from various different sized lamps. It is his skill in dealing with this kind of problem that



makes von der Schulenburg such a success at interior photography.

'Fingerspitzengefühl' is a German word meaning, loosely, the sensitivity of the fingers. It is a word von der Schulenburg uses to describe his way of dealing with difficult lighting conditions. When he is in a situation where checking an exposure with Polaroids is impossible, he applies this approach. He demonstrated this when he was asked to shoot the exterior of author Robert Lacey's Edwardian residence in Chelsea. It was part of a commission for

At the regatta From a series of candid shots that von der Schulenburg took at the annual Royal Henley Regatta in England

Interiors magazine. The picture he produced in a very difficult lighting situation was eventually used to open the story as a double page spread.

The interior is seen through two tall windows which flood the outside street

Jodpur hunting lodge Von der Schulenburg found this fabulous relic empty, and 'dressed' it for the photographs





These two pictures were taken for the British design magazine 'Interiors' for a story on the home of writer Robert Lacey. **Exterior (top)** To create this warm atmospheric shot, Von der Schulenburg waited until dusk and used a long exposure so that he could show the warm glow from the windows and sky. **Interior** Von der Schulenburg took this view of the Lacey's living room from its upper gallery using one of his favourite wide angle lenses to include the whole room. As usual, he paid particular attention to detail, carefully arranging the flowers and objects to provide a good balance within the picture.





Fritz von der Schulenburg Interiors



Circus caravan Part of an assignment commissioned by the German design magazine 'Ambiente'. The Austrian 'Circus Roncalli' is one of the most magical of the travelling circuses which tour Europe every year. Von der Schulenburg supplemented the lighting with his flash units to ensure evenness
Drawing room Taken for 'Interiors' magazine, this shot was part of an assignment about the home of Nicole and Martin Myer in London's Belgravia. Von der Schulenburg lit the fire to create a warm homely atmosphere and used his Norman flash units concealed behind the furniture to pick out details of the decor and the furnishings

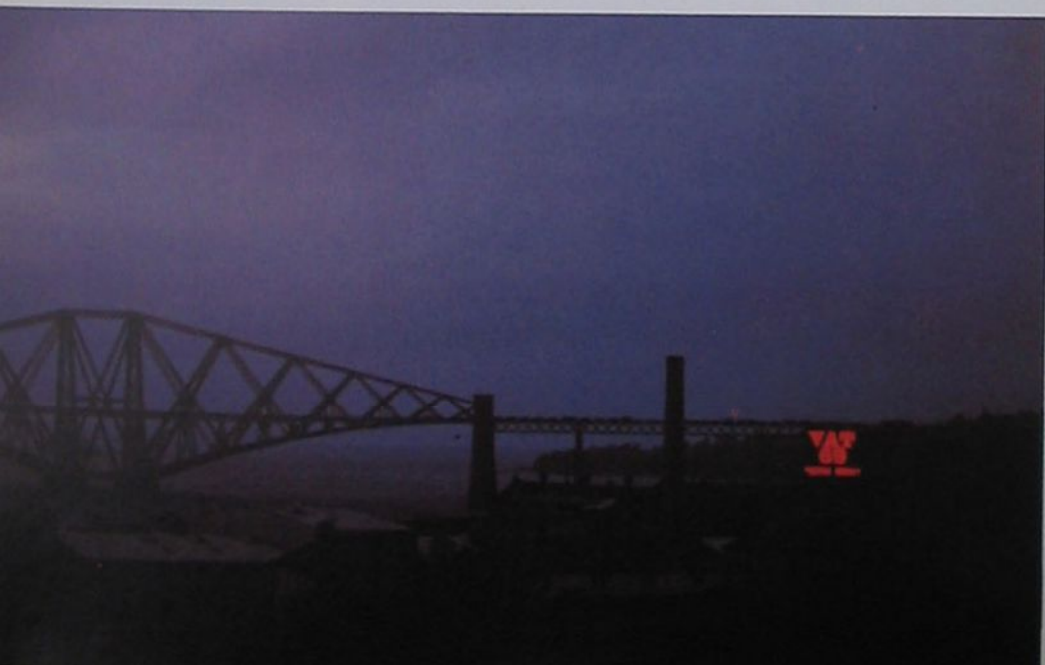


Fritz von der Schulenburg

Senora Cagiati *A portrait of the Italian ambassador's wife at home in London for the magazine—"The Lady Diplomat"*

with rich gold light. Autumn leaves litter the pavement, while inside healthy green ferns still retain their correct colour balance. There is a contrived depth which extends from a few metres to over 60 metres. 'Basically, I had to get

Scotch whisky *Taken for the annual report of the Distiller's Group at dusk in front of the Forth Bridge near Edinburgh*



the time of day right. It was a November day, four o'clock in the afternoon, half-way between day and night. I used tungsten film to bring out the amazing warm glow on the pavement. I then 'guessed' exposure to be 25 seconds at f/16—Fingerspitzengefühl!

Von der Schulenburg uses two flash systems—American Norman 200B units and modified Balcar window lights, which are large diffuser units containing modelling lights (see page 2096). The advantage of the Normans is that they are lightweight, and small enough to be

concealed behind furniture.

The Normans are generally used by fashion photographers and it is very unusual for people to use them for interiors. But they run on batteries and this can be invaluable in difficult locations far from power sockets. When fully-charged, these units provide 200 flashes of 200 joules each. The concealed flash heads of the Normans are triggered by slave units. Their diffused light helps to define the edge of a sofa or a spray of flowers and the effect in the final picture is to draw the eye into the composition. Without this extra light, interior shots can look flat.

However, when he needs to illuminate a large ceiling he uses enormous 1 x 2 metre Balcar window lights which supply 5000 joules of power. 'The size of the room is very important,' explains von der Schulenburg. 'If ceilings are high the Normans won't give enough fill-in, so I use big window lights on stands which are, literally, one big window and I bounce the light off the ceiling.'

Although he generally uses Ektachrome 64 daylight film, von der Schulenburg also uses Ektachrome film balanced for tungsten. With available light in a room illuminated by tungsten, the effect is a pleasing cool atmosphere with odd items bathed in warm pools of light. By increasing exposure times he can effectively warm the mood by degrees from cold to medium cool. 'A

very short exposure where the flash has done all the lighting gives a blue cast,' he explains. 'A 1/15 second is just enough to give the tungsten light a chance to come into the picture. Expose for two seconds and see what happens...'

As many of von der Schulenburg's assignments are on location abroad, mobility is crucial. He travels with two strong aluminium cases in which he packs three Nikons—two F2s and a manual FM. The Nikons all have motor drives and his lenses include an ultra wide 18 mm which he uses carefully to divert attention from distortion. He likes the 35 mm camera for recording detail, but it cannot compete with a 6 × 9 camera in capturing the full lighting range in an interior. To make the most of the smaller format, he uses Kodachrome rather than Ektachrome.

His favourite camera is a 6 × 9 Mamiya Universal which he had modified to make it as light as possible. The viewfinder was completely removed by an engineer and von der Schulenburg composes his shots with the aid of a viewing screen set in the back of the camera. This screen must be removed before the camera can be loaded and the exposure made. Von der Schulenburg also built in a spirit level—something essential in interior shots. The result is a versatile, lightweight large format camera which can be used easily on location.

He often uses the Mamiya with a very wide angle 50 mm lens with a Compur leaf shutter, but he also uses other

lenses—an f/2.8 100 mm and 250 mm, and a 150 mm lens for certain compositions.

Although interiors are clearly his speciality, von der Schulenburg does not shoot them exclusively. Even when on an interior assignment, he usually takes pictures outside to set the interior in context. Sometimes this can be a picture of a town house from across a road, sometimes it is a shot of a mansion in its grounds.

Occasionally von der Schulenburg may add a graduated filter while shooting outside, just to bring the eye away from the sky and down towards the roof. The problem of converging verticals which occurs with wide angle lenses does not bother him—none of his cameras have a rising front, and he does not own a perspective correcting lens. 'I think verticals must be vertical in an interior, but if you want to show the height of the ceiling, it's not always possible to make corrections so I accentuate it instead. I really go over the top, moving in close to the wall and shooting upwards.'

Besides photographing a building and its contents, von der Schulenburg may take portraits of some of the people associated with the building. For instance, when he was assigned to cover the sale of the contents of Haver Castle in England, he photographed the butler and an old gardener who had been working there for many years, and his portraits convey the sadness of the occasion.

Von der Schulenburg also photographed the castle's owner Lord Astor as he stood shyly, half in the shelter of a great sombre doorway. Behind him in the shadows are two suits of armour. Von der Schulenburg chose the spot because of a vivid childhood recollection of Lord Astor's. 'He told me that, as a child, he had always been frightened of these "gentlemen", as he called them. He always bowed as he passed them on his way out of the door.'

The shots he took that day also included a study of a dog in its basket in the grounds and many details of individual pieces of armour and objets d'art. Shots like this bring life to individual stories and provide the variety necessary to make them interesting.

When talking about any of these assignments von der Schulenburg's enthusiasm is continuously infectious. Each new assignment and location is, for him, a fantastic adventure from which he returns laden with images. It is his enthusiasm combined with an attention to the needs of his story that keep him in constant demand for the fresh aspects he brings to his work. 'It's the most marvellous profession', he asserts. 'It is very difficult to get into, but once you do the financial rewards are relatively unimportant compared to the personal satisfaction you can get from it.'

Relic of wealth The former Maharajah of Jodpur's private railway carriage—now rented out for luxury tours of India



Fritz von der Schulenburg

Improve your technique

Testing cameras & lenses

It is infuriating to take a good shot only to discover later that the picture has been ruined by faulty equipment. So it is worth checking your equipment occasionally to make sure that no major faults have developed



Stephen J. Kraseman/DRK Photo

If your pictures are consistently unsharp or poorly exposed, the chances are that your technique is at fault. But it may be that something is wrong with your equipment. And there are a number of simple tests you can carry out to establish whether the performance of your lens and shutter is up to standard.

The tests are designed principally to test lens sharpness, both in terms of resolution of fine detail and accuracy of focusing, and the accuracy of shutter speeds. They are meant essentially as fault finding tests, but you can do them simply to see how your equipment performs.

Lens resolution

You can test the resolution of your lens by taking a series of pictures of a test target and analyzing the results. Various test targets can be used, depending on how detailed you want results to be, but whatever test target you choose, you must do everything possible to eliminate any causes of unsharpness that are due to poor technique.

It is important to mount the camera on a tripod and use a cable release to keep



the chances of vibration to a minimum. The camera must be aligned carefully with the target, with the lens axis square to it and the film plane parallel to the target (see page 944).

If you simply want to test your lens, and no other part of the image system, then you should use the finest grain film available. Ideal films are Kodak Panatomic-X and Ilford Pan F (both monochrome), or Kodachrome 25 (for colour tests). However, it is often more useful to test the resolution of the lens, film and developer combination which you normally use. If the tests give sharp results with this combination, then any lack of sharpness is probably the result of poor camera technique or faults in the focusing system. Also, you should test the lens at every aperture setting.

For a general indication of the sharpness of your lens, try photographing a brick wall—preferably one with a rough texture—at a distance of 7 to 30 m. It should be evenly illuminated and the air must be clear. You can examine the processed pictures to check for clear rendition of both high and low contrast detail at the various apertures and across the field of view.

Frozen moose It is essential that the fast speeds in your camera are accurate if you are to be sure of freezing motion, such as the water drops in this picture

Turntable test This method can be used to test the slower speeds on leaf shutters. Place a mark on the edge of a turntable, measure the distance of the mark from the centre, and then photograph it. The mark records as a blur—the examples below show speeds of 1/8 and 1/60 second—and the length of the blur is used to find the exact shutter speed given by the camera

Using a test chart

If you want to establish the resolution of your lens in lines per mm, you must use an evenly illuminated optical test chart (see page 1075), stuck on a flat board or taped to a wall. These charts are meant to be photographed at a certain distance. The Paterson Optical Test Target 2, for example, is designed so that it fills the frame at a standard distance of 40 times the focal length of the lens measured from the film plane (which is often marked on the camera). If you use smaller charts, it may be necessary to use several to fill the frame.

You should use a powerful magnifier to view the processed negatives or transparencies. Look for the smallest patterns which can be clearly seen, with the bars and spaces easily distinguishable, and note the figure given next to them. This figure represents the line-pairs per millimetre (lpm) which the lens has resolved. With lenses designed for 35 mm cameras, the resolution in the centre of the frame should be at least 50 lpm. A resolution of 100 lpm is very good. You can expect to find lower resolution at the edges of the frame and at large or small apertures, the best resolution usually occurring at around the middle of the aperture range—say $f/8$ for a standard lens.

The most common causes of low resolution are bad lenses and poor processing. To find out which is causing the problems you can run further tests with different lenses, films, developers and development. But before doing this, it is worth making sure that the focusing system of your camera is accurate.

Focusing tests

Focusing accuracy is easily tested using a clearly numbered ruler. Set this at an angle of 30° to 45° to the lens axis, and

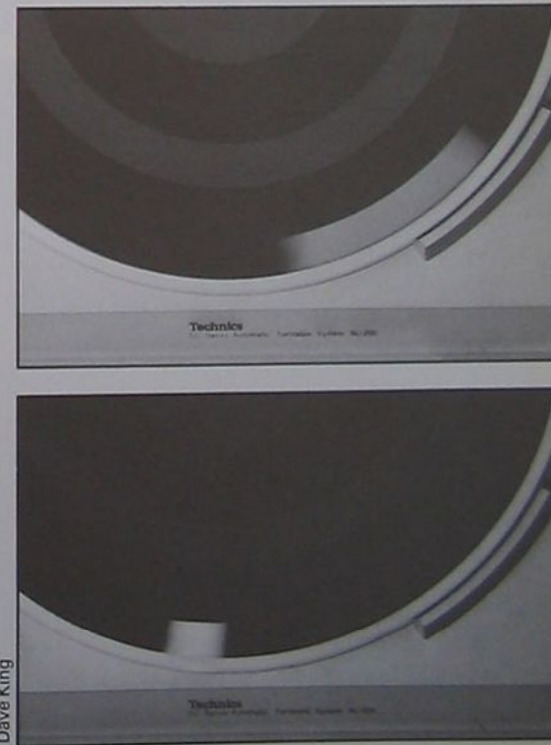
focus the lens on one particular mark on the ruler (making a note of which one) and take a photograph. This test should be performed with the lens at full aperture—small focusing errors may be disguised by the depth of field at narrow apertures. You can then examine the photograph to see if the same mark is still in focus.

If another mark is sharper than the test mark, repeat the test to make sure that you did not make a mistake the first time. If the camera has a removable focusing screen, make sure that it is properly in place. If you are to get the best results from your camera, any discrepancies between the viewfinder and the film plane should be treated by a professional repairer. The same test can be used to check the distance scale marked on the lens. The same procedure is followed, but focusing is done by measuring the distance from the film plane to subject, and setting this distance on the lens.

Distortion

You can check for distortion using the test chart and composing the picture so that the straight edge of the chart is very near to the edge of the frame. If the edge of the chart appears to bow outwards in the picture then there is barrel distortion present. If it bows inwards, then the lens suffers from pincushion distortion. To make sure, make a print from the negative and check the straight lines with a ruler, assuming that your enlarger does not distort prints.

If the lens does have distortion, there is little you can do about it. Fortunately, providing it is only slight, distortion is usually unnoticeable unless your picture includes straight lines, such as the side of a building, or a door or open window, near the edge of the frame.



Dave King

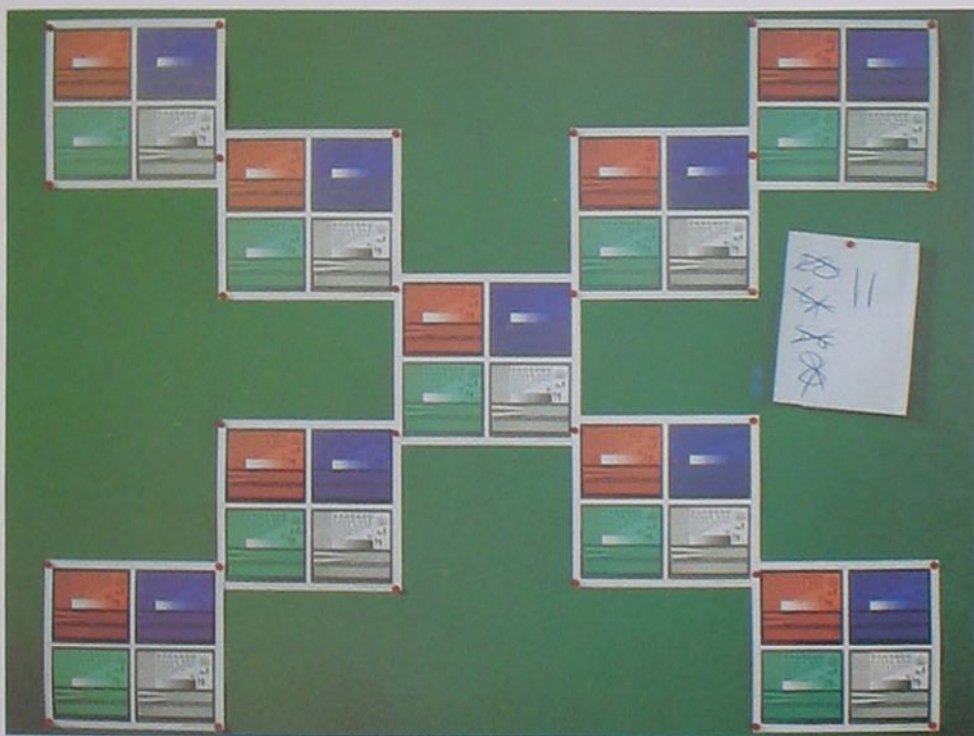
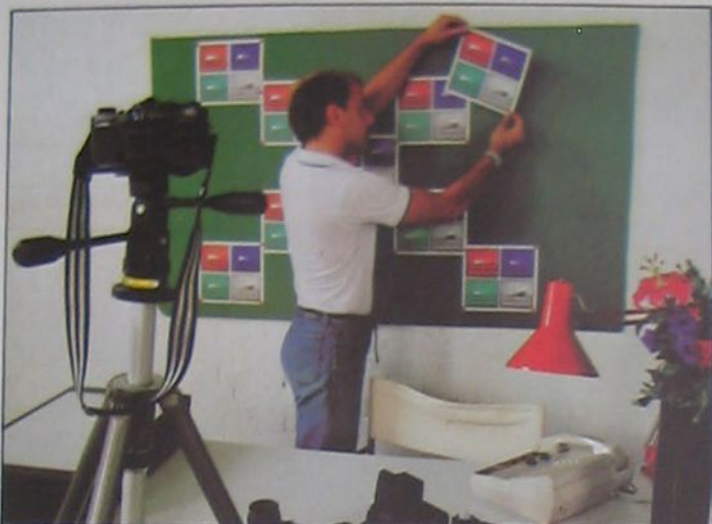
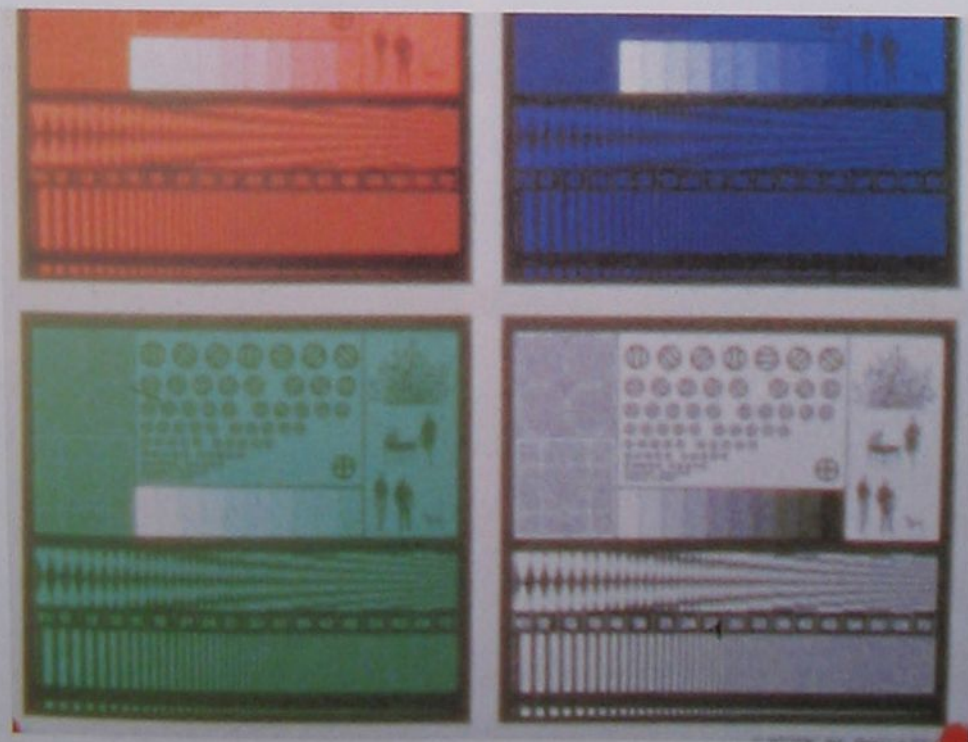
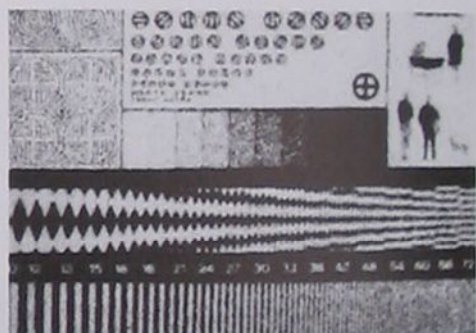


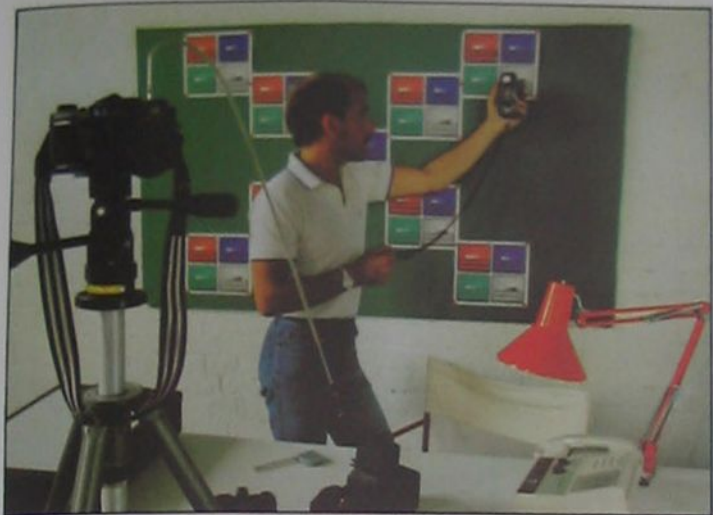
Chart testing The resolution charts are arranged as shown in the picture (left) in order to test both the centre and the corners of the lens's field of view. The enlargements below show the results of shooting the chart. In the color shots, different apertures were used. The large picture, which was shot at $f/11$ displays higher resolution than the other, shot at $f/1.8$. The black and white shot was also taken at $f/11$ with the same lens, but it has higher resolution than the large colour picture due to better resolving power in the film



Shutter testing

The shutter of a camera is not as easy to test as the lens. For complete accuracy, manufacturers use expensive and sophisticated equipment. However, there are some basic tests which you can do to check that your shutter speeds are at least close to the speed set—although they only work accurately for a small range of shutter speeds.

With the focal plane shutters found on most SLRs, you can check some speeds using a standard television set. With speeds faster than $1/30$ second only part



Setting up To test the resolving power of your lens, pin or tape a test chart to a flat wall or board. The camera should then be placed a set distance from the chart (with this chart it is 40x the focal length of the lens). For best results it is important that the illumination is even across the chart, and this can be checked with a lightmeter

of the screen image is recorded (see pages 1841 to 1843). The number of lines which are recorded depends on the shutter speed used so, by photographing the TV and counting the lines photographed successfully, it is possible to calculate the shutter speed.

With the room blacked out (to avoid reflections) turn up the brightness of the TV set and mount the camera on a tripod. Using a fast film (to allow fast shutter speeds) photograph the TV image at all speeds from 1/30 second upwards. Cameras with horizontally run shutters should be used horizontally, and those with vertical shutters should be set for vertical (upright) framing. This is so that in both cases the shutter is running horizontally relative to the television.

Once again you must examine the processed pictures using a magnifier. Carefully count the lines on the TV image, but only include the bright ones—any faint lines are likely to be the 'afterglow' from a previous scan. From the number of lines it is possible, using the formula given (see box) to work out

the actual shutter speed.

The dark area of the TV screen, as seen on the pictures, is usually a diagonal strip. You may notice that the width of this strip varies slightly across the screen. This is due to acceleration of the shutter blinds during operation. So, for the sake of consistency and accuracy, always count the lines in the centre of the TV image. Also, as colour TV screen images are made up from three sets of dots or lines (see page 1841), which can be confusing and difficult to examine, it is better to use a black and white TV set.

Leaf shutters can also be tested by this method. Indeed counting the lines is much easier with leaf shutters since the dark band is horizontal. But you can test the slow speeds on leaf shutters as well by using a record player turntable. To do this, place a bright mark, such as a small white or yellow sticker, right at the edge of the turntable. Then, with the turntable revolving, photograph it at various speeds. The mark records on the film as a blur, and from the length of the blur you can deduce the shutter speed. Unfortun-

ately, this test is inaccurate at fast shutter speeds because of the small movement of the mark during the exposure.

The best turntable speed for shutter testing is 45 rpm, which gives three-quarters of a revolution per second. It is important that the speed of the turntable is accurate, so you really need a turntable on which the speed is adjustable and can be checked using calibration ('strobe') markings on the rim.

Mount the camera on a tripod directly above the turntable. Place a scale marked in centimetres next to the turntable and make sure that this is included in the pictures. The subject should be reasonably well lit. Using black and white film, photograph the turntable at all speeds from 1/60 second and slower, and from these shots make life-size prints (using the scale included in the pictures to check the size).

To work out the effective shutter speed, you must work out how far the mark travels in one second. Measure or calculate the circumference of the turntable (assuming that the widest part of the mark is on the very edge). As it is moving at 0.75 revs per second, the distance moved in one second is three-quarters of the circumference. For example, for a turntable with a diameter of 26 cm, the mark travels 61.5 cm in one second. Next, measure the total length of the blur on the print, subtract the original length of the mark (to find the actual movement involved) and divide the result by the distance travelled in one second. This gives the shutter speed. If, in our example, the blur is 3.5 cm long and the mark is 1 cm wide, then the shutter speed is 2.5 divided by 61.5, giving 1/24.6—virtually 1/25 second.

Focus test To check the focusing system, one mark is focused on and photographed, and the negative is viewed to see if the same mark is still sharp

TV shutter test

Calculating the shutter speed is done by counting the number of bright lines that can be seen in the photograph, and then using the formula below. This calculation is based on the number of lines employed by the TV system you are using, and the time taken for one complete scan. For example, in the UK 625 lines are used with a scan rate of 1/25 second.

$$\text{shutter speed} = \frac{1}{(L/C) \times S}$$

where L = number of lines used by the system

C = number of lines counted in the photograph

S = scan time

If, for example, you can count 312 lines on a British (PAL) set, this indicates a shutter speed of $1/(625 \div 312) \times 25$, or approximately 1/80 second

Dave King/camera courtesy of Bronica



Assignment Disneyland



The 'Magic Kingdom' is a world of frivolity for people of all ages to enjoy. Sergio Dorantes spent some time there and has captured the basic elements—the fantasy and the people

In Disneyland you do not have to look very far to find interesting subject matter. There is so much that strikes the eye in this fantasy world that the photographer is hard pressed to do it justice in a single day and has to be highly selective about what to include and what to leave out.

We asked Sergio Dorantes to go there and spend a day trying to capture the atmosphere on film. He soon found that Disneyland forced him to work quickly—mainly because there was so much ground to cover—but also because if he saw something interesting and failed to act quickly, he found the subject could

easily disappear or the composition would change shape or colour. For these reasons he found it useful to have two cameras, so one was ready for use at all times. One was fitted with a 20 mm wide angle lens and the other with an 80–200 mm zoom. These focal lengths covered most eventualities, but for more static subjects Sergio knew he could take his time and fit whatever lens seemed to suit the subject.

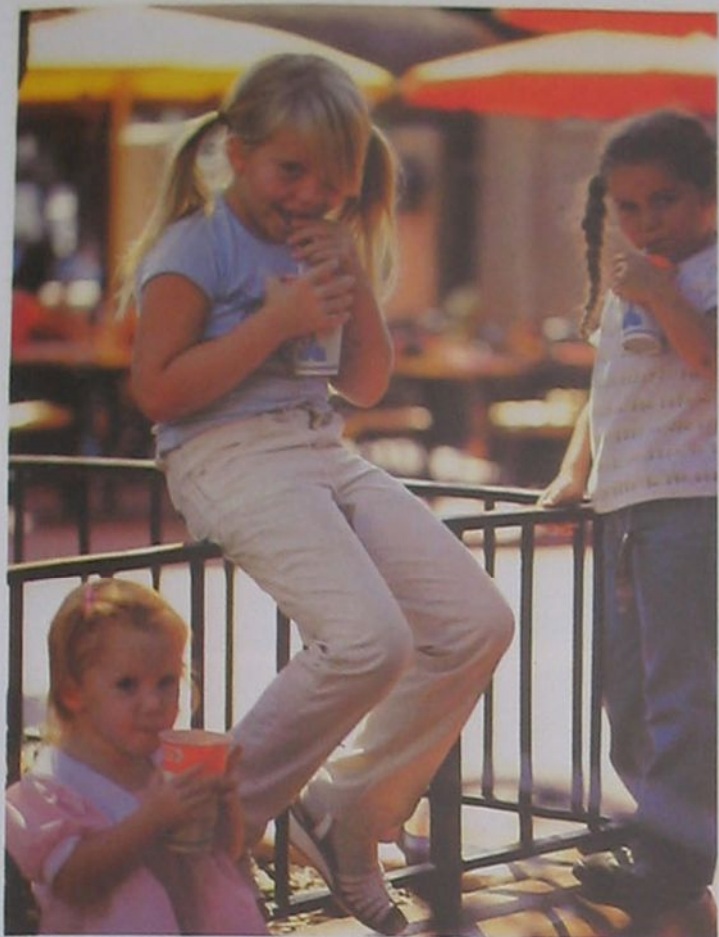
Photographing Disneyland is largely a matter of photographing people. Most of



Mickey Mouse and friends No photo assignment on Disneyland would be complete without a portrait of the famous cartoon character

New Orleans Square Many parts of Disneyland make picturesque shots. Extra interest has been added with the double bass

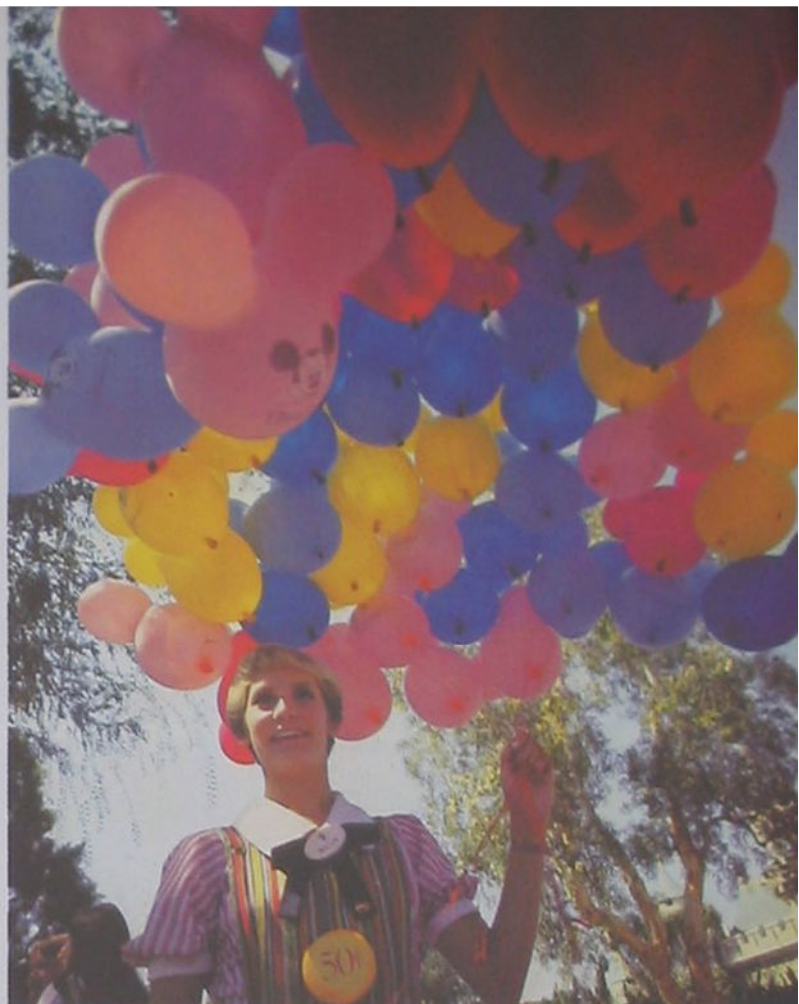
Mickey Mice Small details like this add strong clues to the feel and essence of a place—here, it is tourism



Flying elephants Sergio has used his wide angle lens to achieve a striking graphic effect in this picture. The shadows are a strong element of the composition

Very young ladies This trio seem to be sharing a private joke. This shot clearly expresses the mood of a day at Disneyland

Balloon seller Using his 20 mm lens, Sergio filled the upper half of the frame with colourful balloons. The staff at Disneyland are always happy to be photographed



Sergio's shots feature people, but they are always captured in relation to the 'magic kingdom' theme and are rarely just straight portraits. He has carefully included people who actually work at Disneyland, like the balloon seller, as well as the fantasy characters and visitors, caught at different moments.

Another interesting feature of this presentation is Sergio's inclusion of details of smaller features such as the street musician's double bass and the row of Mickey Mouse souvenirs. These

shots add visual variety and a more intimate feel to this personal view.

To exploit the bright colours, Kodachrome 25 transparency film was used throughout. However, Sergio was always wary of including too much colour in case the effect became overwhelming. You can see this assignment covers a judicious selection of photos which have strong colour and of those which rely on light, shadow and patterns. All of these qualities were enhanced by slight underexposure.





Series and themes

Photographs that form a series on a particular theme can mean much more than any of the individual pictures—and they can make a good long term project. There is a vast range of subjects suitable for pictures on a theme

When you are out and about with your camera or at home in the studio, it is easy to assume that every picture must stand on its own merits. So you tend to look for instantly memorable or attractive subjects. But a picture need not stand by itself—it can be part of a series. And a complete series of pictures on a common theme may be far more telling than any of the individual shots.

One of the main advantages of looking for series of pictures rather than individual shots is that it frees you from the tendency to include a great deal of information in each photograph. If you know you will cover other aspects of the subject in subsequent shots, you can make the image simple and all the more effective. Then you begin to look for interesting details that might otherwise go unnoticed or unappreciated. Some subjects might simply not work in isolation—a photograph of a single door, for instance, might be uninteresting, but a whole series of photographs could make a fascinating study.

Nevertheless, it is important that the series has some cohesive idea behind it. A collection of shots of similar subjects does not necessarily make a good series. They must have something to draw them together visually—perhaps a similar treatment of the subject. And, of course, a series approach is no excuse for weak shots—a single weak shot can detract from the effect of the whole series.

Once you have decided on a particular series, there is no need to work on it to the exclusion of everything else. You can simply keep it in the back of your mind and keep adding shots when the occasion arises, though this depends on the nature of the series. However, a series approach might provide some interesting new angles in a single photo-

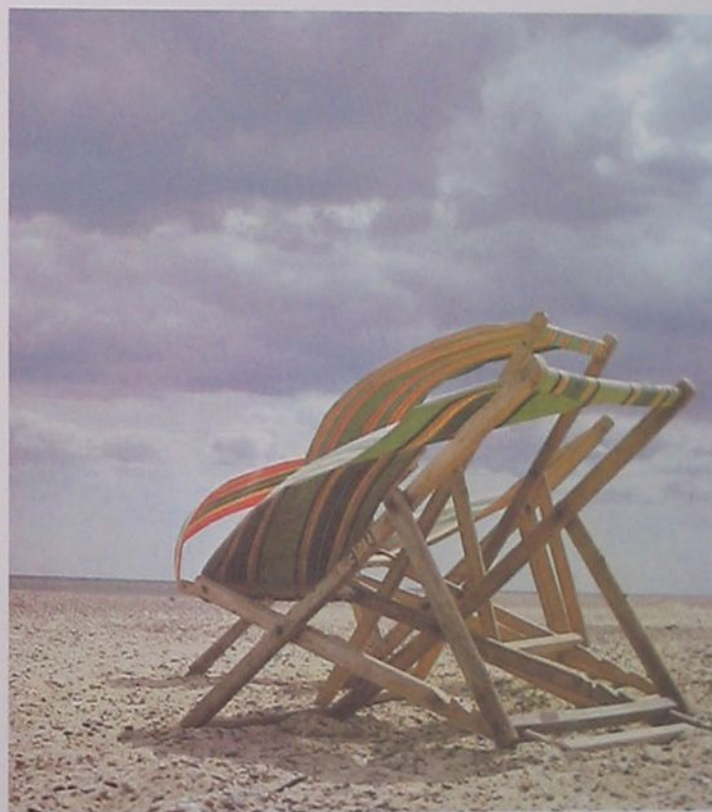
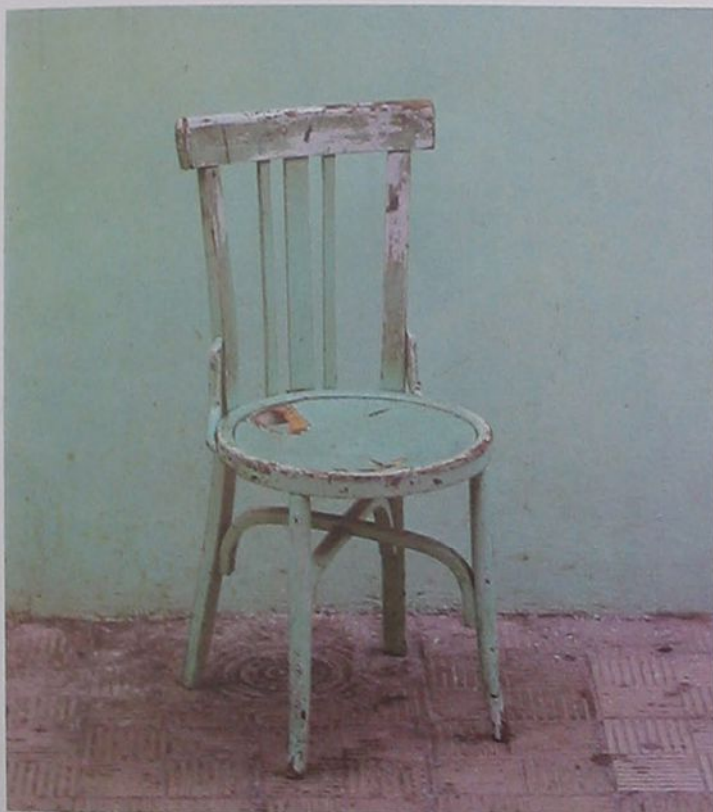
Four seasons *Almost any scene will reveal changes throughout the year, but rural areas work best. Choose days which you feel typify each season best, if you can. You can extend this series almost indefinitely from year to year*

Chairs *No subject is too mundane to be ignored as a theme. In fact, your pictures should bring out the wide diversity to be seen. Chairs are an ideal subject, since making them has been a craft for centuries and they are found wherever you go*





G. I. Bernard/Oxford Scientific Films



Robin Bath



Spot the theme A series such as this is ideal for display since the theme—the colour red—is most obvious when the shots are seen together. It is best in this case to choose objects which are as diverse as possible yet which have colours which match as closely as possible. A two colour theme is also worth attempting, particularly if the objects have similar shapes

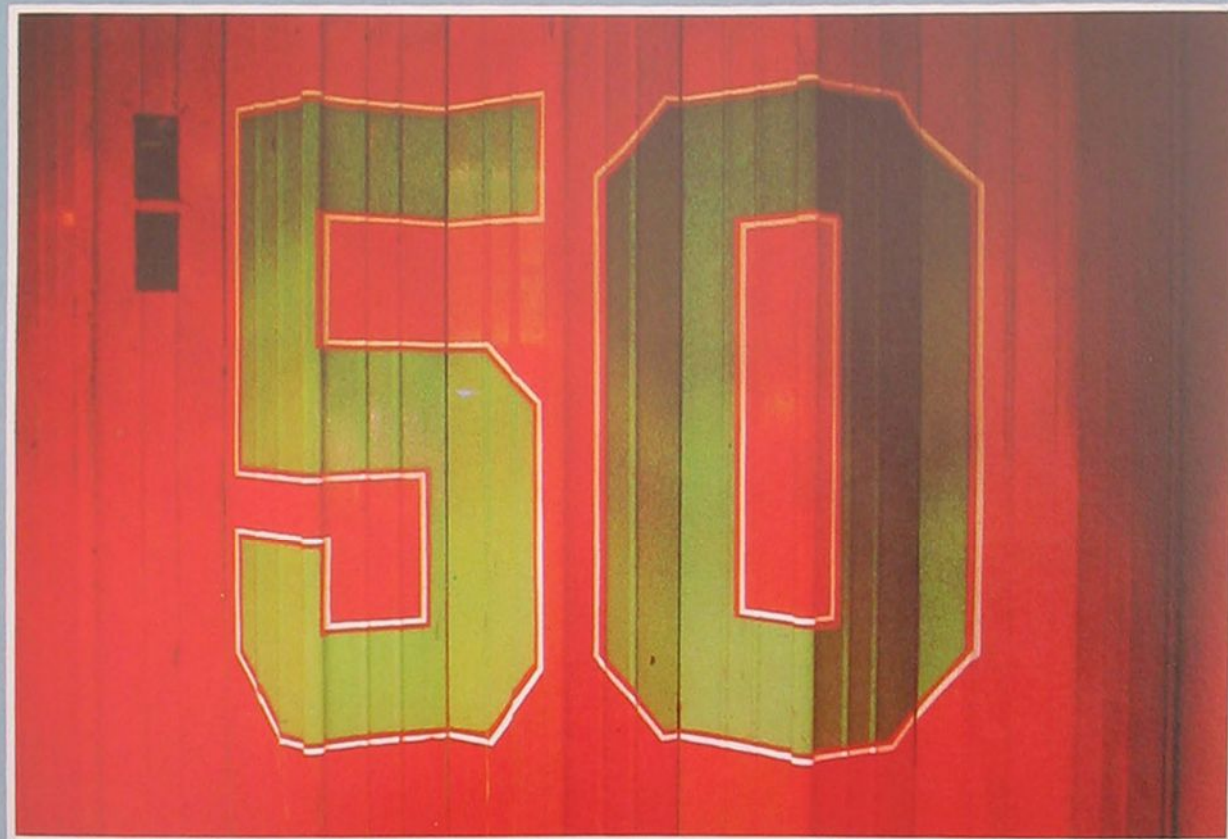
session. For example, when taking a portrait of a friend or relation, you might find it worthwhile to try and produce several images out of the single sitting. Try shooting from various viewpoints—for head shots, think about three-quarter angles, profiles, silhouettes as well as the more conventional portrait. But also photograph more unusual aspects—hands, fingers, arms or eyes. You will end up with a portrait in parts showing sides of the person perhaps not normally revealed as clearly.

Other sets of pictures which can be shot over a relatively short stretch of time are 'before and after' sequences. A building or neighbourhood, for instance, can be shot before, during and after

demolition, or a car before and after restoration. But the idea can be applied to a number of subjects—a room being decorated, a garden in spring and in full summer bloom or a house in daylight and again after dark.

With a long term series project, you need to work out precisely what you want to achieve and plan your approach carefully. It is important, particularly when the series involves a similar treatment of a subject, to make the shots sufficiently varied to keep the images alive. An individual photographic style is well suited to a series, reinforcing the unity, but the results can become repetitive unless you vary the basic approach—different viewpoints, lighting, lenses, and other variables. It is worth adding occasional humour to relieve the tension of more serious subjects.

As well as varying your photographic technique, think also in terms of the way



Numbers An example of a series which can be collected almost anywhere. Photographer Ed Buziak uses film ends to photograph numbers wherever he happens to be. Those here include a New York theatre ticket, shop front and door numbers, and the number on a railway carriage on Snowdon mountain railway in Wales. All were taken using a Micro-Nikkor lens. He also photographs letter boxes and stripes

pictures will work with one another. All photographs, whether for a professional assignment, for a portfolio, a competition or simply a slide show, need to be organized so that they fall into some sort of order in terms of the subject, the scale, framing and overall weight of the images.

Once you start thinking about longer term projects you will find that there is an almost infinite number of subjects open to you. Your family or friends could be used for a set of group or individual portraits—or you could expand to a theme of a family as a part of a neighbourhood—along the lines of Bill Owen's book, 'Suburbia' (see page 1917).

In your own town or city for instance, you could shoot a set of shopfront photos

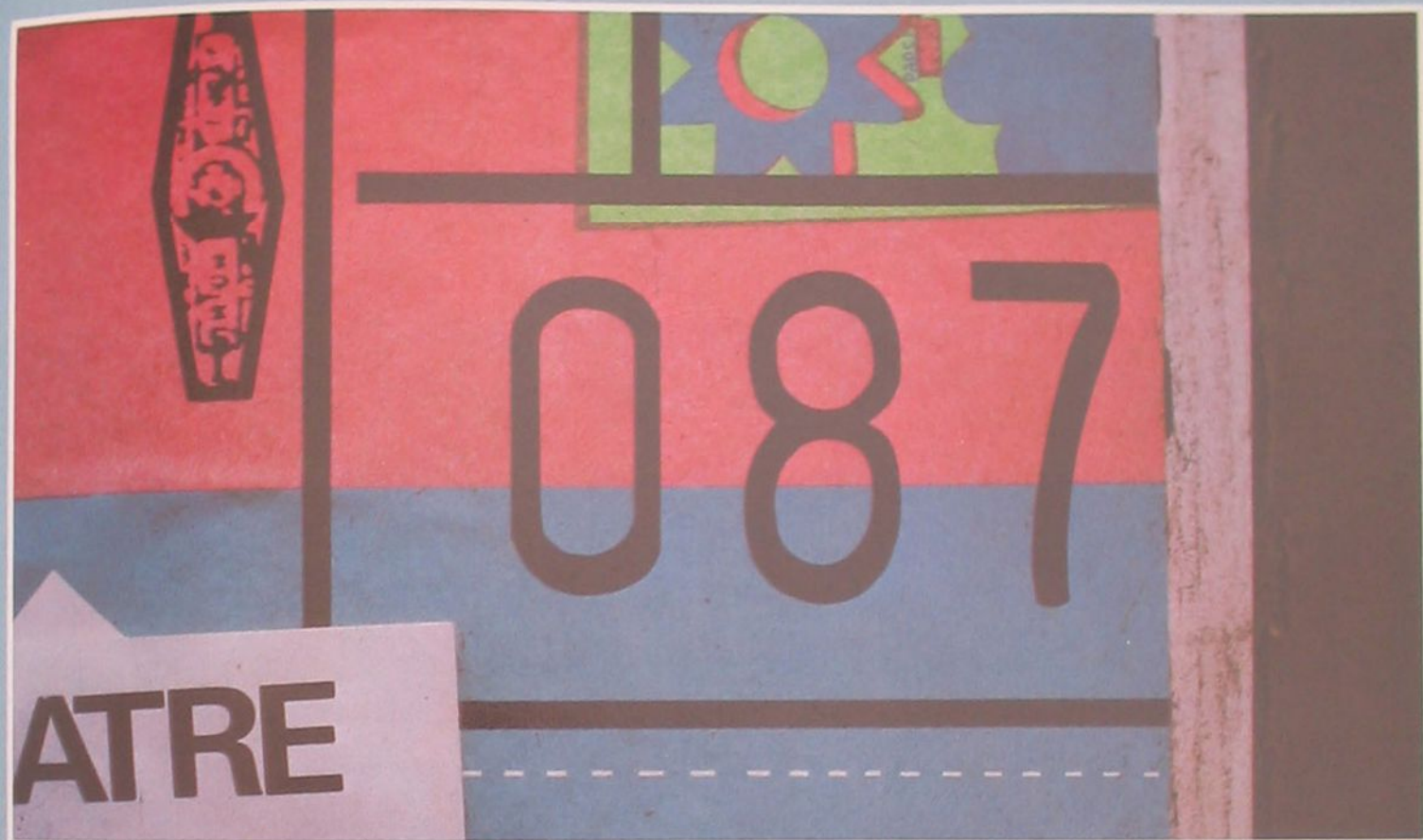


over an extended period of time. This could make a fascinating set, especially if you concentrate on older, more traditional establishments. Their signs, window displays or general styling could be the focal point. Or else you could narrow down the idea further, concentrating on shop doors or detailed studies of sign lettering. The success of such a theme could depend on differences between simple and highly

elaborate doors, or between modern ones and the boarded up doorways of derelict premises.

Very similar in idea is a set of photographs of close-ups of a similar group of plants with the emphasis on the fine detail and colour differences or the strong abstract and textural qualities of flowers. Even very common garden plants are very different in extreme close-up. The inside of a tulip, for

example, is very different from the inside of an iris or a rose. Details of a rhododendron, azalea, carnation or foxglove provide an amazing world of contrasting colour. It is in this context too that a further aspect of this approach to photography comes through most vividly — its usefulness as a learning tool. The biological differences between flowers in terms of their constituent parts can also become a very important factor in





Handy work Parades and other public events give Sergio Dorantes the opportunity to extend one of his themes—people's hands, which can be particularly expressive



Shadow shots In Alan Porter's series the shadows are a constant theme which links a wide variety of photographs on different subjects. The shadows need not feature prominently in the picture



a set which allows direct comparison.

A series need not necessarily involve the same subject; the theme could be a particular colour, or a particular weather condition. However, with this sort of project you have to plan your approach carefully to avoid ending up with a collection of unconnected photographs which just happen to feature a particular colour.

The colour green, for instance, is found in a range of subjects from close-ups of leaves and plants to the corrosion of copper and bronze or a verdant rural landscape. But for a series the scope is too wide and visually the set would not say a great deal—except perhaps how pleasant the colour green is. However, by thinking about a potential 'green series' a little more carefully you might well decide that it would be far more productive to concentrate on a more definite aspect. For instance, green leaves come in a huge range of shapes, sizes and shades of colour. A series of photographs using quite a wide range of lenses and techniques could be built up starting in early spring and lasting through the autumn. It would make both a strong visual statement about nature as well as creating a strong feeling about the colour.

Any colour can be treated as a theme, although some colours offer far more scope than others. Red, for instance, tends to stand out wherever it is used,

but the idea of red as a colour of aggression is a little too obvious as a theme. Too much red is also overwhelming. It might be better, therefore, to look at other aspects of red and try a subtle approach. Small areas of red in an otherwise colourless scene might provide a good starting point for a theme. A red bus in a wintry landscape, a red car in a mass of black taxis, a person in a red jumper in a sea of grey suits or a red hang-glider set against a crystal clear azure blue sky are all examples of a more thoughtful use of red.

The same approach is even more necessary in an abstract theme which uses a colour as a major element. The theme colour must never be allowed to dominate the other colours unless the subject itself is of interest or if the emotional content of the colour is appropriate to the overall mood of the picture.

A set of abstract photographs where colour, form and compositions make up the basis of the relationship is an ideal subject for a series. A strong set of shots could be based solely on geometric shapes. Since the photographic frame is usually rectangular, the use of the diagonal is the simplest starting point—on this line you can introduce other photographic elements. Triangles or circles of shape and colour can be framed along this diagonal. Modern buildings are a particularly good subject

for this type of photography, but you will also find plenty of scope in cars, coaches, bridges and details of other man made objects.

Apart from colour and purely abstract design, there are several other photographic elements that can be emphasized to create a series of photographs. Texture, grain, reflections or movement could all be featured as a set. For example, the skin tones of a human body could be the starting point of a close-up series based on textures. From here you could continue with a detailed set of shots on brick, wood, stone, sand, metal or any other contrasting texture.

A series concentrating on movement could encompass anything from a set of sports pictures all shot at slow shutter speeds to blur movement, to a group of shots showing movement in nature—waterfalls, water dripping from trees, fields of wheat moving in the wind.

However, whatever the subject you choose to photograph as a series you will find that the discipline of an extended project and of looking for several images which relate to the basic theme is worthwhile in itself. It will train you to notice small details or aspects related to the main subject that might otherwise have escaped your attention. Not only that, but also you will end up with a set of photographs that will make far more impression upon the viewer than a single image is ever likely to manage.

What went wrong?

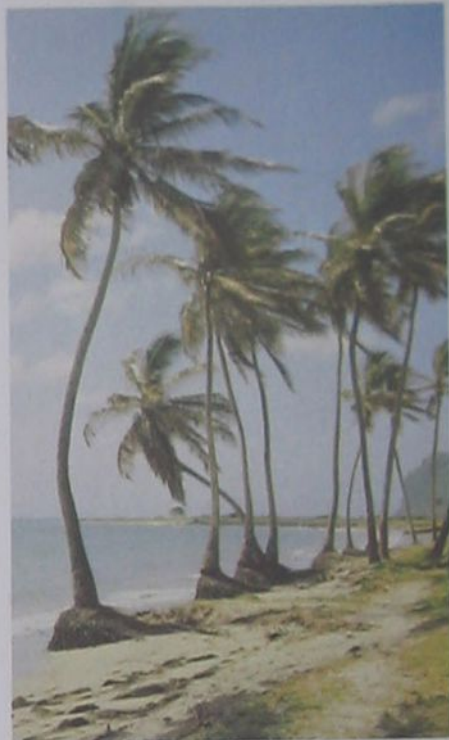
On the beach

'Holiday snaps', taken on the beach, can be the starting point for much more interesting pictures as professional Homer Sykes shows



I like the composition here, especially the inclusion of the log at the top of the picture. It's a pity that this is not sharp. A tripod would have helped. Use a slow shutter speed and stop down as much as you can for the depth of field. Another version of this picture would have been to include the sky line. A lower angle or a slightly wider angle lens would do the trick. When wandering around on the beach, don't feel satisfied with just one picture like this.

This picture could easily have been improved. It is really a rather dull picture. If I were taking this picture, I would have chosen a different time of day. In hot sunny countries the light at midday is very boring and contrasty. Far better to wait until evening when the sun is low and the shadows are longer. A polarizing filter would darken the sky, giving some depth to the picture. I think the photographer should have tried to get some human interest into this shot.

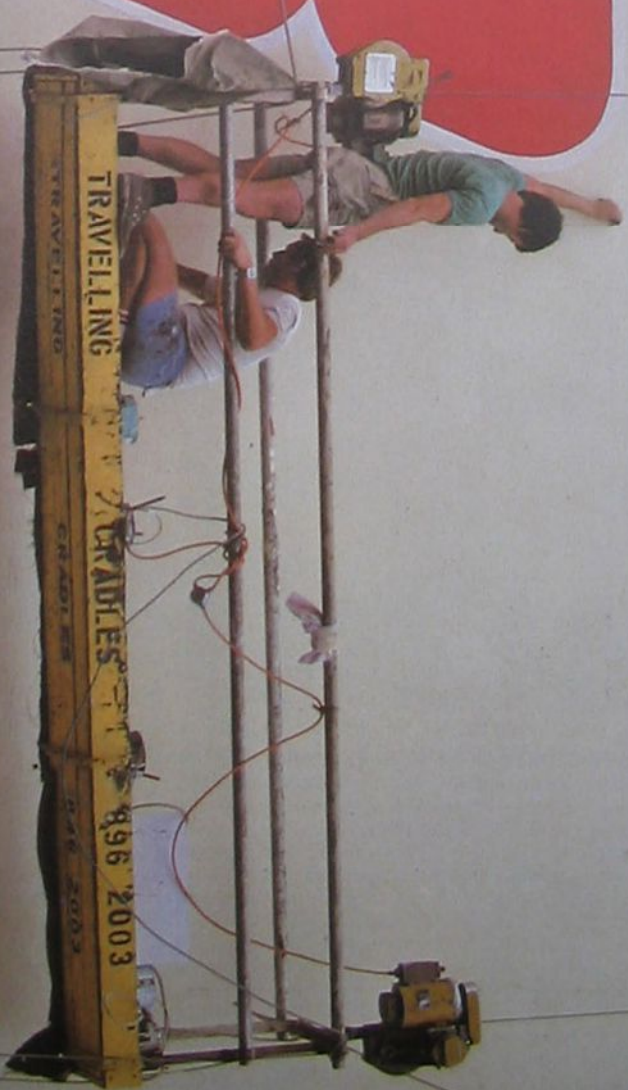


This photograph of a mother and child on the beach is really awful. Almost everything is wrong. But it is at least sharp and the photographer has managed to give it the right exposure. The mother's face is in shadow and as a result we can't see who she is. The photographer should have either waited for the sun to move or else moved his subject. The child's teddy bear has its face turned away. It would have been far better to see its face. One of the woman's feet has been framed out. The angle is also all wrong and, as a result, half the picture is out of focus sand that adds nothing to the photograph. The other half is an equally uninteresting area of sea. The waves are breaking, but unfortunately directly behind the child's head, thus distracting from the main point of interest.



This is really quite a good picture. However, it could be improved with just a little more planning of the composition. What a pity that the photographer cut the mother's legs off just below the knee and that the children are hidden behind each other. The mother should be positioned higher up on the rocks so as to include all of her with the children not so tightly arranged. One child could be standing, perhaps with a hand on mother's shoulder, and the other child could be sitting or crouching.

100





World of photography

From hand tints to Kodachrome

The earliest colour photograph was taken as long ago as 1861, but it was 80 years before the first truly modern process emerged—yet the intervening years were far from unevenful in the history of colour photography

Nowadays, colour photography is so simple that even the rawest amateur can take pictures in full, natural colour at the touch of a button. Indeed, it is easy to take colour for granted. But the road to the development of a cheap and simple process is littered with brilliant inventions and false starts, fortunes won and fortunes lost, and an array of characters large and small.

From the very earliest days of photography, there was talk of pictures in colour. But, for many years, it was little more than talk. Even in 1878, a full 80 years after Niépce's first, dim black and white photograph, a writer commented that 'reproducing colours... would seem to be the criterion of photographic

Although colour rendition and resolution were less than perfect, some early colour processes gave beautiful, atmospheric pictures, like this Autochrome of 1910

power: on the face of it, the problem seems insoluble.'

Yet the early black and white pictures soon seemed to be inadequate and people began to colour prints by hand. For portraits, one of the photographer's tasks was to note down the colours of everyone's clothes so that he could colour the prints accurately later. Hand colouring became quite an art, and many photographers made their reputations through their skill in colouring. Graystone Bird, for instance, a photographer in Bath at the turn of the century, became famous for his delicately coloured lantern slides.

Aids to hand colouring proliferated in the 100 years after 1850 and some of the



James Clerk Maxwell, the young Scottish physicist, who made the first colour photograph in 1861. His technique, using three separate emulsions to record the red, blue and green content of a scene, provides the basis for all modern colour processes.

Japanese girl Hand colouring became quite an art in the late 19th century and this print, by A. Farsari, is typical of the many beautiful Japanese hand tints



Mansell Collection

claims made were extravagant. A crystal-
 leum painting method, for instance,
 offered to 'transform your photographs
 into pictures' incorporating 'Nature's
 colouring'. Some, such as the Flexi-
 chrome process (introduced as late as
 1940) could, in skilled hands, give deep
 pure coloured pictures—Flexichrome,
 unlike most methods did not involve
 colouring a black and white print, but
 applying dyes to a gelatin relief image.

Hand colouring continued to be
 popular for a surprisingly long time.
 Even as late as the 1950s, some photo-
 graphers preferred hand colouring,
 because it was simpler and more
 reliable to make a black and white print
 and take it to an artist, than go through

the long exposures and processing
 sequences needed for a colour photo.
 Look in shops in out of the way places
 and you may still find coloured postcards
 on sale, easily recognizable by their
 grey look and the misalignment of blocks
 of colour—caused by poor registration
 of the stencils used to print them.

While the comparatively low price of
 hand colouring gave it popular appeal
 until well into the 20th century,
 photographers had always hoped for a
 real photographic colour process, a way
 of recording colours in the same way that
 black and white photography recorded
 tones. And throughout the 19th century,
 numerous scientists, inventors, photo-
 graphers and businessmen tried their

hands at producing a successful process.

At first, the interest seemed to be
 largely scientific and the main advances
 were made by physicists like Johann
 Seebeck and Sir John Herschel who
 noted how silver chloride changed
 colour according to the colour of the light.
 But once photography began to become
 popular, people began to appreciate
 that the inventor of a genuine colour
 process would not only be widely
 applauded—he would also be very rich.

Soon all kinds of people joined the
 search. It became an obvious thing for
 the Victorian amateur scientist and man
 of leisure to put his spare intellectual
 capacity to work on. In the eagerness to
 be first, minor successes were some-

times blown up out of proportion.

In 1851, for example, an apparently respectable American clergyman, the Reverend Levi Hill, declared that he had found a way to produce daguerreotypes in colour. There was considerable excitement and scores of photographers went out of business as the public waited for the new colour process before booking portrait sittings.

The Reverend Hill showed his 'Hillotypes' to only a few people and promised to reveal the details in a book priced at \$5. After receiving \$15,000 in advance orders, Hill was eventually forced to publish a much cheaper edition describing little but a few elaborate changes to daguerreotype plates. Nobody could reproduce Hill's efforts, and interest evaporated quickly. It was eventually concluded that Hill's 'process' was a fraud, and that his Hillotypes were

appeared that colour photography was on its way. But even Maxwell's experiment, though it provides the basis of modern colour process, was, at the time, an unrepeatable fluke—because no-one had discovered how to make silver salts sensitive to colours of light other than blue. Not until Vogel's almost accidental discovery of sensitizing dyes were photographers able to take advantage of Maxwell's method.

Colour photography stumbled forward on many different tracks during the second half of the 19th century and the early 20th. Some pursued the ideal of direct, objective colour reproduction, for instance, and interference processes such as Professor Gabriel Lippmann's (see page 1914) had some success—it was even marketed commercially by the brothers Lumière of Lyons in France and Carl Zeiss of Jena around the turn of the

century. But this system, although favoured by scientists for its theoretical superiority, never really had much chance of popular acceptance.

The future, of course, lay with three-colour processes. At first, additive processes like Maxwell's, using primary colour filters, seemed to be the way forward. But while each picture required three separate exposures and elaborate arrangements for projection of the separation positives in register, the popular appeal was likely to be limited. Then in the 1890s, special cameras and viewers came on to the market.

First on the market was the American photographer Frederick Ives with his Kromskop viewer which went on sale in 1895. Ives was a prolific inventor and his genius was turning theoretical concepts into practical processes and ideas. Among his many inventions was a 3-D



Russian bell For mass-produced travel pictures and postcards, like this stone bell in Moscow (c. 1910), it was far more practical to colour a black and white print than make a genuine colour print even though processes were available.

Arum lily, 1898 A lantern slide made by the first additive screen process—the Joly line process.

Frederic Ives and the Kromskop Among the many practical inventions of the American photographer Frederic Ives was the Kromskop of 1895 for viewing stereo pairs of separation positives



Courtesy of the Kodak Museum

simply coloured daguerreotypes.

It soon became clear that there were going to be no instant solutions and the progress to a successful colour process was to be slow and painful. Often, discoveries that seemed to be major breakthroughs could not be exploited without considerable further progress.

In 1855, the young Scottish physicist James Clerk Maxwell, only 24 years old at the time, suggested the use of three primary colour filters for recording and projecting a colour image using black and white photographic material (see page 1915). It seemed to be the answer. And after his demonstration of the process with the aid of photographer Thomas Sutton in 1861, it might have



Courtesy of the Kodak Museum

movie camera working on the anaglyphic system.

The Kromskop was rather like the chromoscope proposed by Ducos du Hauron in France 30 years earlier. By using a clever arrangement of coloured transparent reflectors, the Kromskop enabled a viewer to look through an eyepiece and see all three separation positives combined in a full colour image. Indeed, Ives' first Kromskop actually gave a 3-D image since it took stereoscopic pairs of separation positives.

The Kromskop was intended mainly for commercially produced pictures—Kromograms—rather than people's personal photographs. These pictures were taken on a camera that, like the viewer, used an arrangement of reflectors and prisms to allow the three separations to

be produced in a single exposure. However, Ives also marketed a *repeating back* that fitted to a normal plate camera for those who wanted to make their own Kromograms. This held a long plate and could be slid across the back of the camera to make the three separation negatives in quick succession. A spring driven version allowed the three exposures to be made in as little as 15 seconds in the right light.

In London, the Kromskop was advertised as 'the most beautiful invention of the 19th century'. It rapidly became popular among the more wealthy—Kromograms were very expensive, even then, and a number of cheaper alternative rivals appeared, but the taking and viewing system, using three negatives, was still too elaborate for widespread appeal.

The Autochrome process, using an additive screen of dyed potato starch grains, was the first popular colour process. When it was first introduced in 1906, the art world took it up enthusiastically and there is a strong artistic influence on many early Autochromes. André Personnaz, the French photographer who took the limpid river view (right) and the flower girl (page 2229), was a great friend of the Impressionist painter Pissarro, and the influence is clear. The influence of Manet is similarly evident in the nude by Paul Bergon. The inventor of the Autochrome process, Auguste Lumière, is pictured in his lab (left), applying dyes to the starch grains. The engraving shows plate making in the Lumière factory. Three-colour cameras gave photographers the three separation negatives needed for prints in a single exposure



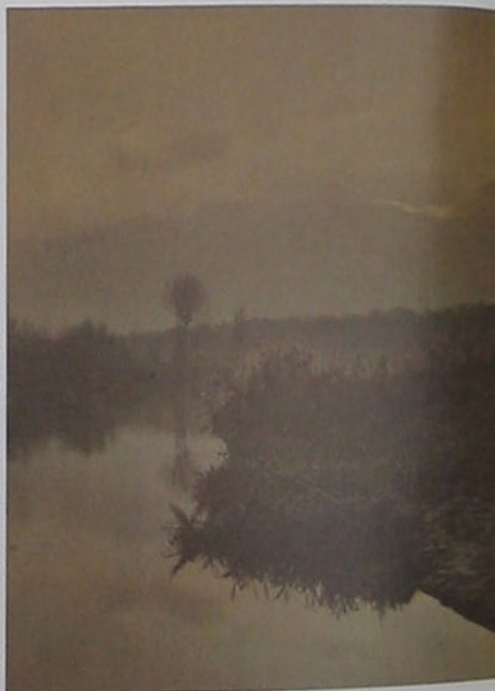
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Personnaz/Société Française de Photographie/fotogram

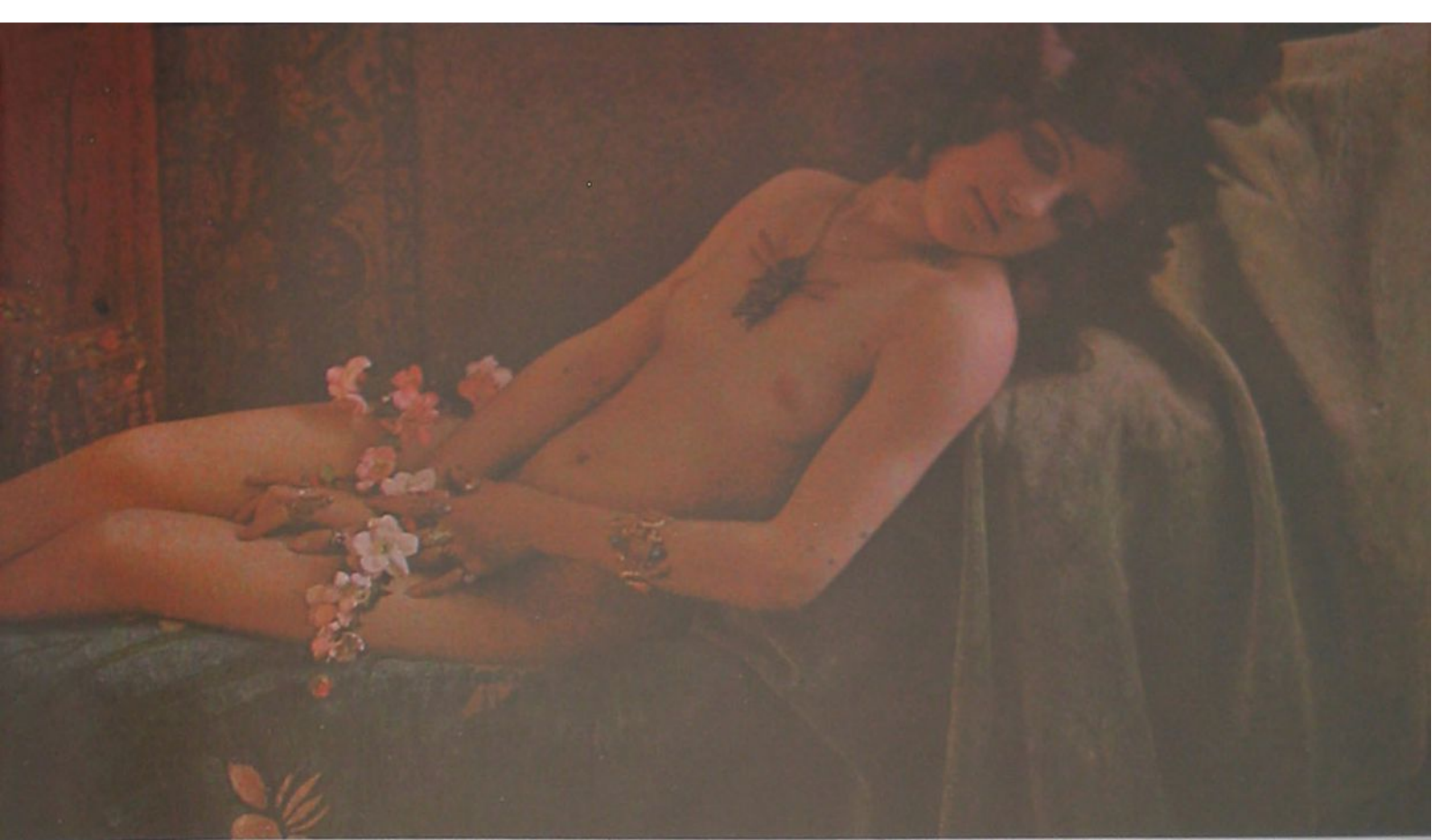


Bergon/Société Française de Photographie/fotogram



Mary Evans Picture Library

While Ives was working on the Kromskop, however, a professor in Dublin called John Joly was developing a system which, while not giving such high quality results, was the forerunner of the first genuinely popular colour process. Following another idea of the Frenchman, Ducos du Hauron, Joly's success was in ruling red, green and blue-violet filter lines on a gelatin screen set in front of a photographic plate. So the three separations needed for a full colour image could be recorded on the same plate. Only one exposure was needed, and the resulting slide could be viewed without any special



Courtesy of the Kodak Museum

equipment. A similar process was invented, also in 1895, by James McDonough in Chicago. Although both systems were marketed, neither were successful because the lines cut out so much light that exposures were unacceptably long.

Some years later, however, the French brothers, Auguste and Louis Lumière made the big breakthrough with an improved screen process, using dye potato starch grains rather than ruled lines. This process, known as Autochrome, was introduced in July 1906 and was an instant success. Alfred Steiglitz, the leading light of the Photo-Secession

(see page 1504), was typically ecstatic, proclaiming that 'from today the world will be colour mad'. Demand for the Autochrome plates was tremendous and soon they were being manufactured at the rate of 6000 a day.

Autochrome undoubtedly produced remarkably good colour, but the key to its success was the fact that it could be fitted in an ordinary plate camera and that it was very easy to use. Exposure times were relatively short—a summer landscape needed only one second at $f/5.6$ —though this is slow by today's standards (about 0.4 ASA!).

Over the next 25 years, many other screen processes came on to the market from Agfa Colour to Dufaycolor, and they undoubtedly did much to help popularize colour photography. But they had one great disadvantage—the amount of light they cut out. The thick filters blocked out over 70 per cent of the light and made exposures very long. In black and white, exposures could be short enough to stop action as early as 1860—colour did not achieve this sensitivity for almost 100 years.

Even as colour screen processes were making their mark, work was progressing on a colour system that was to prove the answer to this problem. Again, the original idea of subtractive colour (see page 1940) had come from the fertile imagination of Ducos du Hauron. But it took almost 70 years for the idea to become a viable alternative to additive processes.

At first, people concentrated on developing special cameras for the subtractive process, rather than on the film. Undoubtedly, one of the main reasons for this was that amateur inventors could

build their own designs and use commercially available plates. In the years leading up to World War I, hundreds of designs were patented, some successful and others totally impractical.

These three-colour cameras were intended to produce three separation negatives in a single exposure. The subtractive part of the process was essentially in the making of a colour print, using dyes coloured in the three complementary colours (yellow, magenta and cyan) to make up the image—additive processes could normally only be used for slides. However, a number of these cameras incorporated complementary colour filters and reflectors which allowed two or even all three plates to be sandwiched together. In Bennetto's camera of 1897, for instance, blue and blue-green sensitive plates were strapped together in a bipack with a yellow filter sandwiched in between to give the blue and green record.

Ideas for tripacks, in which all three plates were bound together, were suggested, but few had any success until Frederic Ives again turned the ideas into practice with his Hiblock system. Unlike the previous subtractive process, the Hiblock plates could be used in any plate camera.

Various similar systems followed, some successful, others not so successful—including the notorious Colorsnap (on film as well as plates), which proved to be one of the biggest financial disasters in the history of colour photography. After massive investment, Colorsnap was launched in March 1929 amidst a blaze of publicity. By December, the company had been liqui-



dated. Unfortunately, colour rendition was not very faithful and sometimes during processing pictures had to be coloured by hand. Once they were said to have coloured a photo of a pillar box in the traditional red colour of the British Post Office only to find that the picture had been taken in Eire where the boxes are green!

With all these systems, the three images had to be separated to make a print or slide and the real success of subtractive systems had to wait until someone came up with a suitable method of forming an image dye in each of the layers without separations. Rudolph Fischer had the idea, patented in 1912, of including colour formers in each emulsion of the tripack to stimulate the formation of appropriately coloured dyes. Unfortunately the formers tended to wander from layer to layer during processing. These problems were generally too complex for the amateur to have much chance of solving and research began to pass into the laboratories of the big photographic companies like Agfa and Kodak. But there were exceptions.

Intrigued by the problem, a couple of young professional musicians, and inseparable comrades, the pianist Leopold Mannes and the violinist Leopold Godowsky, began to experiment with their own colour plates. Early in the 1920s, they had arranged a



meeting with George Eastman, the founder of the Kodak Company, but for a number of years, they worked independently. However, Kodak's head of research, Dr Kenneth Mees, gave the pair considerable encouragement and by 1928, Dr Mees decided to risk taking them on the staff at the Kodak Research Laboratories in Rochester. But in the tight-knit community of Rochester, the appointments caused a certain amount of resentment at first. The two musicians had only one bachelor degree between

them, yet they had to work within a group of highly trained scientists.

To make matters worse, they had a number of annoying habits, not least of which was whistling in the darkroom. They did this not to amuse themselves, however, but to time their photographic processes. Years of musical performance had given them both perfect timing, and by whistling Tchaikovsky's 6th Symphony they were able to keep time in total darkness—a luminous clock could well have fogged their plates.



Village scene Dufaycolor, c. 1937.

Dufaycolor, introduced in 1932, was one of the last additive screen processes. The screen of very fine greasy ink lines, (with 20 lines per mm) gave relatively good image quality and the film was sensitive enough to permit exposures of up to 1/50 second at f/8 in bright sunlight. It remained popular well into the 1950s. **Summer picnic** Colorsnap, 1929. Despite massive investment, this early subtractive process proved unsatisfactory and processors were reduced to colouring prints by hand

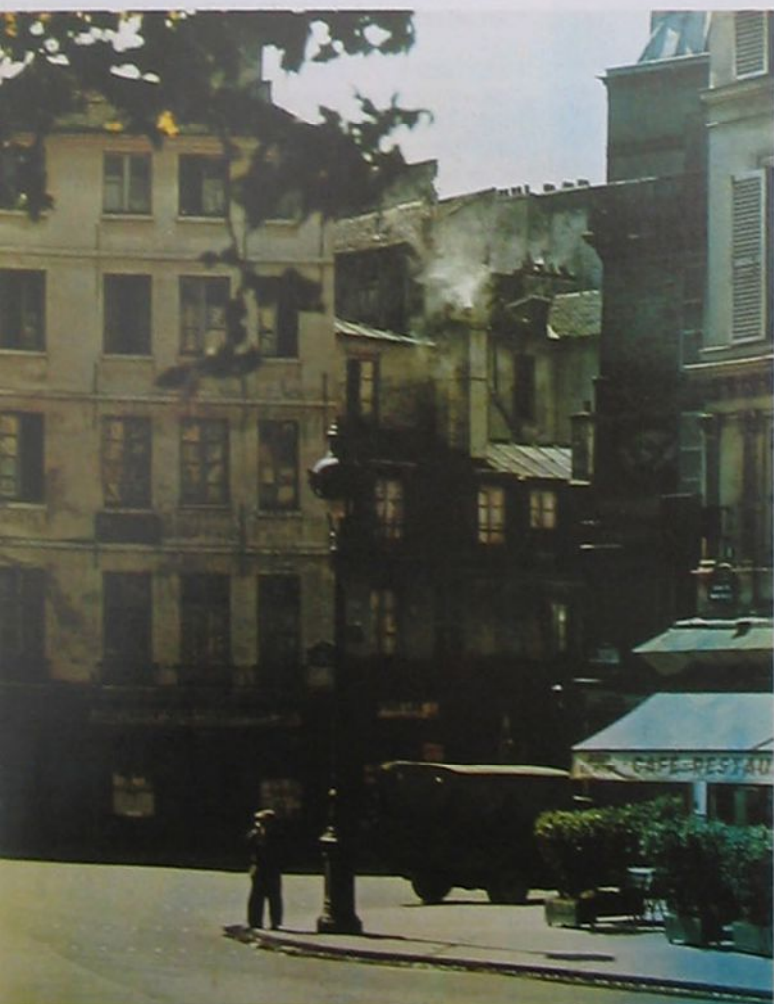
Leopold Godowsky and Leopold Mannes, the professional musicians who worked together in the Kodak Research Laboratory to create Kodachrome, the first integral tripack process, and open the way to the popularization of colour photography. Below right is an early Kodachrome (1937). **Street in Paris, 1938** Barely a year after the introduction of Kodachrome, Professor Williams of Agfa successfully made a tripack film, Agfacolor, which incorporated the colour formers in the emulsion during manufacture, making processing simple

However, by 1935, 'God and Man', as they were affectionately known, had with the aid of the staff at the Kodak Laboratory, created a new and original solution to the problem of dye formation, a solution which was to revolutionize colour photography. The new film was called Kodachrome. Although processing was complicated because not only the dyes, but also the colour formers were added during processing, the film gave superb colour and was extremely usable. After improvement in 1938, Kodachrome has remained the standard by which all colour films are judged.

Only a year after the launch of Kodachrome, Professor G. Williams of Agfa managed to solve the problem of wandering dye couplers, by using very large molecules. With the advent of these two processes, Agfacolor and Kodachrome, the way forward to modern colour photography was open.

The films could be loaded into conventional cameras, gave short exposures and superb colour. Essentially, anyone who could take pictures at all could take high quality colour pictures.

After World War 2, Agfa's research secrets became available to all, and naturally most of the rivals to Kodak have been based on the Agfa principle. Even Kodak's own film, Ektachrome is similar. And progress in colour moved away altogether from individual trial and error to expensive research laboratories. But without the characters of early colour photography, the versatile, inexpensive and simple to use films of today would not have been possible.



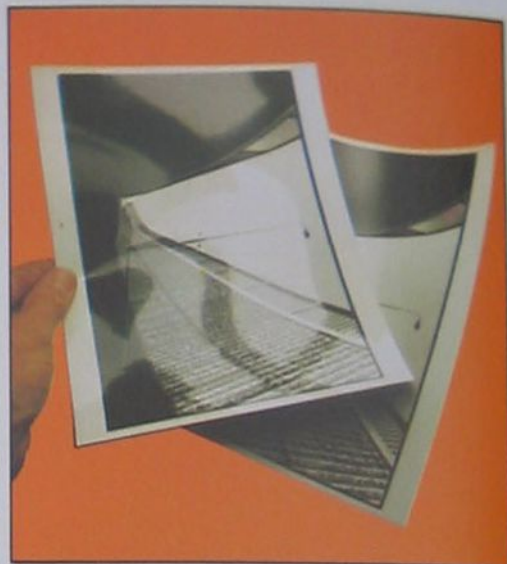
Courtesy of the Kodak Museum



Courtesy of the Kodak Museum

Which paper?

Once you can produce good prints on your standard make and type of paper, it is time to explore the range of papers available. There are a large number of paper types on the market and each gives a different base tint, image colour or surface texture



Dave King

Surface choice The basic choice you can makes lies between glossy (above, upper sheet) and matt or pearl (lower sheet). All makers offer these in both resin-coated and fibre bases. Glossy paper renders finer detail and gives deeper looking blacks, with a wider tone range, but matt paper is more suitable for display

contrasty effect which accentuates harsh, 2-D shapes and plays down form. Or you can use soft paper to achieve the opposite effect.

It is usually easier to become familiar with the effect of paper grades and speeds if you stick to just one make of paper. But by switching developer types and changing exposure methods, you can still make subtle and often worthwhile improvements to the image quality of your prints.

You could, for instance, achieve higher contrast by using more concentrated developer than normal—or 'speed' developer in place of a normal two minute one. This can add considerable 'punch' to an image without losing too much shadow and mid tone detail.

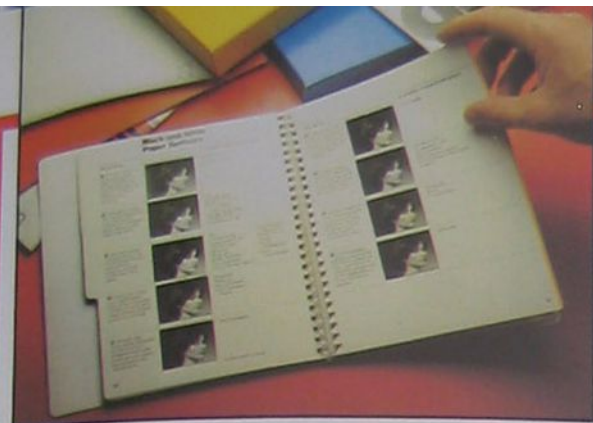
When developed for longer than normal, prints on rapid development RC paper (such as Ilfospeed and Ilfospeed Multigrade) can sometimes gain surprisingly in depth and impact. Development should last about two minutes and exposures should be such that the image appears after about one minute—though it may be necessary to reduce exposure to retain any shadow detail.

Alternatively, you could try developing RC paper in a different developer make or type, but you should not do this with Multigrade. For example, the image

Some photographers only ever use one type of paper for all their black and white prints in the reasonable belief that familiarity is the best way of perfecting technique. But there are many different paper contrast grades, surfaces and emulsions, each giving a slightly different effect. And the difference between a competent darkroom technician and a master printer is the ability to select the paper to suit the picture.

Contrast grades

When printing in black and white, your main decision is between the various grades of paper (see page 2238), and your choice must obviously depend on the effect you want to achieve. For most prints you clearly want a good 'average' range of tones, and the paper grade must be selected to give this result with each negative. Alternatively, you can use harder grades than normal to achieve a



Kodak paper selection Only a few of the full range of papers manufactured by Kodak are available worldwide—but their selector card shows the effect of different surfaces



characteristics including image colour (see below) are noticeably different when Ilfospeed, developed in its own Ilfospeed developer, is compared to results passed through slower working 'normal' developer such as Kodak D-163.

If you are using standard RC or bromide paper you can achieve extra control over contrast by varying the relationship between exposure and development. A long exposure at a small aperture will often give a slightly lower contrast result than a short exposure wide open, although the ultimate exposure received will be the same. This difference can be up to as much as three-quarters of a grade if development takes place at higher temperatures.

Image colour

The image colour of black and white printing paper can range from one make's blue-blacks to another's warmish, almost brown-black. Although this image colour is largely a characteristic of the paper emulsion (see page 2126), often substantial variations can be introduced by subtle manipulations in exposure and development—particularly with chlorobromide papers. Chlorobromide papers give warm images compared to the neutral or cold blacks normally obtained with papers whose emulsions are mostly composed of silver bromide. Although most subjects need a cold or neutral black image, a warm-toned image can improve some subjects such as portraits which look better for the soft, subtle image and the apparent increase in shadow detail. Developing to achieve a warm tone is also a quick and simple alternative to the preliminary sepia toning needed in some toning processes.

Developers like Kodak Dektol, Selectol, and D-163, and Agfa Neutol WA, are designed to give the warmest results and by experimenting with the use of these, you can achieve subtle variations in image colour by direct development.

You may be able to use your normal, energetic print developer for processing chlorobromide paper. But instead of using the normal dilution—which would probably only give cold or

neutral black tones—try increasing the dilution and subsequent development time. If you have some potassium bromide, add a little of this—about 5 g per litre of working developer at double dilution—to act as a restrainer. Pro-

Image colour The warm brown image offered by chlorobromide paper (below) compares with the fairly neutral colouring of a purely bromide-based emulsion (bottom). This paper characteristic is worth exploiting for its pictorial effect





Contrast choice The basic papers in each range usually offer the widest choice of contrast. This is the Ilfospeed Glossy range from 0 to 5—grades differ between manufacturers. Ilfospeed Matt is not available in grades 0 to 5, while Galerie only comes in grades 1, 2 and 3. Odd paper sizes also have a limited contrast choice

longed development of this type also introduces subtle variations in the image colour of even normal bromide paper.

Paper surface choice

The type of surface also has a considerable effect on the appearance of a print. Glossy paper gives the deepest blacks and the biggest tonal range (see page 2126) and the effect can be accentuated by heat drying RC paper or by glazing fibre-based papers (see pages 2104 to 2106).

Unfortunately, fingerprints and marks tend to show up badly on glossy prints—and surface 'reflection' can be a nuisance

Making your own tests

The contrast grades and the other print paper characteristics of an unknown type or make of paper can be established—as it was for your 'normal' paper—simply by prolonged practical experience. But for instant reference you may find it rather quicker to conduct precise tests for characteristics such as paper speed and contrast. Kodak manufacture several types of step tablet (two are shown below) which can be used in place of a 'standard negative'. These can be enlarged or contact printed to produce test prints like those shown arranged in strips on page 426, illustrating the behaviour of Ilford Multigrade without a filter (left strip) and with filters 0 to 7 (left to right, for the remaining strips). Although these tests were made for Multigrade, there is no reason why you should not conduct similar tests for other papers.

By directly comparing the steps with tones in your negative, you can establish thresholds for printing maximum and minimum densities in the negative.

You can also compare the printing speed of unknown paper with your usual stock simply by comparing the resulting tone step print for any given exposure. The number of visible steps will also give an accurate idea of the tone range that can be handled.





Paper choice Most makes and types of paper are available internationally. But some special purpose or types of paper may have to be ordered specially

when prints are mounted and displayed. So, in situations where the utmost in sharpness and tonal range are not required, other surfaces may be more suitable.

A variety of lustre and satin finishes are on the market with names like pearl, semi matt, and velvet or velvet matt. Differences between brands are very subtle—the apparent grain on the surface may be quite noticeable (as in Kodak K high lustre finish), or so fine as to be barely visible (as in Ilfospeed semi matt finish).

You can create or amplify the atmosphere of your work by selecting the appropriate surface. For a print to be submitted to a newspaper, you may need the brilliancy and higher sharpness of glossy paper. But for a high class portrait, a soft fine grain matt finish on a warm, off-white base may be better—the texture of the surface helps conceal tell-tale traces of retouching.

Some papers have embossed finishes looking like canvas or tapestry and these are ideal for big enlargements where extensive retouching is necessary. A very smooth but textured finish like Ilfospeed matt or Kodak N finish accepts pencil retouching easily. Two other kinds of embossed paper finish are made. *Silk* is a fine pyramid grain surface well suited to prints that will be subject to considerable handling. *Stipple* looks like 'pebble dashing' in miniature—and tolerates comparatively rough handling well. Both of these surfaces are frequently used for enprints for this reason.

Base tint

Base colours can vary according to the baryta coating which is used. This may be tinted—giving natural ivory or off white backgrounds. Or it may be white, increasing the highlight tone separations—or fluorescent white that turns ambient ultraviolet light into visible brilliant white. Commonly used white glossy bromide may not be as effective as a warm tone paper for say, a low key mood portrait.

Paper makes, types and surfaces

Resin coated papers

All the major manufacturers produce RC monochrome papers with brilliant white bases in matt (grades 1 to 4) and gloss (grades 0 to 5). It is worth remembering that gloss paper gives deeper blacks than matt, so a negative that prints well on one grade of paper may not print well on the same grade matt. Grades also tend to vary between the different manufacturers.

Agfa Brovira Speed is the RC version of Agfa's popular film-based bromide paper, Brovira. It is available in five contrast grades—the extra hard grade 5 is considerably harder than Ilford grade 5. This RC paper is available in gloss and semi-matt finishes.

Ilfospeed RC comes in grades 0 to 5 in all surface choices: gloss, matt and pearl. Generally, the middle grade Ilford papers seem to have a marginally lower overall contrast than the Kodak equivalent, Kodabrome II (Type 2450).

Kentmere make an RC paper called Kenthene. Satin and stipple finishes can be obtained in four grades, and gloss is also available in an extra 'special' contrast grade between 1 (soft) and 2 (normal).

Tura High Speed RC papers come in four grades with six surfaces—white glossy, white matt, velvet, velvet matt, white silk, and white fine grain. Tura also make an identical range of papers with self adhesive backs—you simply process them like normal prints and, when dry, peel off the backing layer and lay it on to the mounting board. There is no allowance for adjustment once contact has been made, so your placing must be accurate. The mounting board should have a porous or similar surface offering a good key for the adhesive.

Variable contrast paper

Ilford Multigrade is an RC material coated with a variable contrast emulsion. It is similar to Ilfospeed in that it comes in pearl and glossy surfaces and its range can be compared with that covered by grades 0 to 4 in Ilfospeed. The different basic grades are achieved by the use of three basic colour filters when printing. A set of seven further colour filters from straw yellow to purple/magenta can be used to isolate one of eight grade 'steps'. When used without filters the paper is said to be equivalent to Ilfospeed grade two, but, in practice, you may find it to be nearer grade one. Multigrade requires its own special developer to allow both emulsions to work properly—but you can use this for other RC paper, including Ilfospeed.

Kodak Polycontrast is a variable contrast fibre paper made for the American market. It is available in gloss or matt lustre, ivory lustre and high lustre white, and also smooth lustre white on a lightweight base. It works on the same filtration principle as Multigrade but any proprietary developer can be used, although Ektanol and Dektol are recommended by Eastman.

Fibre-based papers

In the UK plain fibre-based bromide papers are still available from Kentmere and Ilford, and both ranges are available in gloss stipple and semi-matt (Kentmere call it satin). Glossy is made in grades 0 to 5 in Ilford and 1 to 4 Kentmere, semi-matt in grades 2, 3, 4 from Ilford but 2 and 3 from Kentmere in doubleweight only. Stipple finish can be obtained in grade 2 from Ilford but 2, 3 and 4 from Kentmere. Matt grades 2, 3 and 4 come from Kentmere and their silk surface, which looks like Eastman Kodak's embossed pyramids grain super-coating finish, is made in doubleweight only.

Kentmere Document Art, like Eastman X, is a fairly contrasty high speed emulsion coated on a very thin paper base. It is so called because it is used in proof printing for negative filing systems and data storage—but can also be used for bromoil printing (see pages 2196 to 2200). The thin base means it has a tendency to curl in drying, and can be difficult to mount as a result. However, Kentmere Document Art takes toning quite well, and is cheaper than ordinary bromide. It has a coarse feel and tapestry-like appearance, because the paper is embossed during manufacture. It is available in Kentmere grades 2, 3 and 4.

Ilford Galerie falls into a category with Agfa Brovira. These are both doubleweight fibre-based bromide emulsion papers for exhibition uses. Both have a plain white paper base. Both these papers, particularly Galerie, give a warmer image similar to that achieved by processing chlorobromides in ordinary print developers. No special developer is needed for Galerie or Brovira. Four grades of Galerie are obtainable in gloss or matt, whereas five grades of Brovira are available in glossy or filligran glossy—which is like textured gloss or stipple.

Despite limited ranges in the UK, Eastman Kodak still produce a wide range of fibre-based papers for the USA market, as well as RC, and each range offers various surface options. In addition to F (glossy), and N (semi-matt) types, Kodak make surfaces coded E, J, and K—finishes which start as fine grain semi-matt and get progressively more glossy and coarser grained. The K finish surfaces look like that of imitation leather.

There is also a G finish. This is the semi-matt equivalent of K, but ivory-based and on doubleweight paper—and it is also treated to accept oil colours.

Surface A is a smooth fine grain lustre falling between N and E. It has a brilliant white base on extra lightweight paper and is said not to crack on folding. R and X finishes are tweed and canvas embossed respectively—both have ivory tint bases and offer simpler retouching since the mottled surface hides any irregularities of spotting or knifing.

Chlorobromide papers

The choice of true chlorobromide papers is fairly restricted and you may find it available only to order from one of the specialist photo dealers. All the fibre-based chlorobromides are on doubleweight paper. Agfa Record Rapid has four grades of contrast in 'glossy', which can be dried naturally to give a semi-matt finish or a smooth lustre depending upon the amount of hardener in the fix bath and the temperature of the drying. A high gloss can be achieved by immersing the print in hardener in water before hot air drying. For maximum gloss use Tetenal Mirasol glazing fluid and glaze the print.

Agfa Portriga Rapid is a chlorobromide emulsion on an ivory base and comes in three grades equivalent to 1, 3, 5 grades in Record Rapid. The surfaces are smooth glossy or filligran semi-matt, which is a sort of textured eggshell matt.

Agfa Portriga Speed is the only resin-coated chlorobromide and comes in four grades on an ivory base with gloss or textures matt finish. Tura is a French made paper similar to Record Rapid and Tura Record Rapid paper comes in four grades but has five surfaces available—glossy, matt, silk, velvet matt, and white fine grain. Kentona follows the same lines but is made in gloss or stipple with three grades soft, normal and hard. With all papers availability varies from place to place.



Creative filtering

Often, photographers are divided over the effectiveness of special effects of colour filters, but like all other creative techniques, their successful use depends upon an imaginative and subtle approach

Many photographers believe that instant creative photography lies no further from their grasp than the special effects filters in the bottom of their gadget bags. If it were as simple as that then everyone's collection would be brimming with creative masterpieces—but the reality is very different; truly creative shots, with or without filters, are relatively hard to take.

However, filters do have a place in creative photography but it is important to realize that special effects alone will not do the job for you. When you are about to reach for a filter, you should already have answered an important question—'why does this photograph need it?' Basically, there are two answers. To produce an unusual or attractively different image from the already good picture you see before you; or to make something of a subject that, without a filter, does not stand up as a good shot in its own right. Whatever the case, you should always assess first the merits of a scene without a filter.

More than anything, creative filtering needs a subtle touch: the filter should never draw attention to itself. If the first reaction to your pictures is 'Ah! that was taken with such and such a filter', you can be fairly sure that you have overdone the filtering.

Clearly, then, the more dramatic special effects filters should be used sparingly. Indeed, it is often the mundane filters that are most valuable creatively, allowing you to make small but nonetheless effective adjustments to the image in the viewfinder. Many photographers use colour balancing and compensation filters, for instance, only in situations where the ambient light and the film are in some way incompatible. But these filters can be used to subtly alter the colouring even in a scene where no correction is necessary.

In scenes where the colours are generally pale, for instance, you can often give pictures extra impact by strengthening the colours already present with a coloured filter. Warming filters in the 81 series are particularly useful in this respect, because people are naturally attracted to warm colours.

When the sun is weak in winter, or when the vegetation is bleached by the heat of midsummer, landscapes can seem pale and insipid. A mild warming filter helps to bring out the colour. Even when the natural lighting or colouring is already warm—during the late afternoon or in autumn, for instance—you could use a warming filter to exaggerate the warmth and bathe the landscape in a rich, golden glow.

But it is important not to overdo it—a filter that warms up the landscape nicely may take all the sparkle and freshness from a blue sky. Try to make sure that the filtration is in sympathy with the scene and, to start with at least, use filters only where the result is 'realistic' or plausible. A yellowish sky looks attractive when the sun is low at dusk, but distinctly odd when it is overhead at midday.

Nevertheless, with a little thought, you can sometimes use strong warming filters 'unrealistically' to create a particular mood or feeling. For shots into the sun or for scenes with strong contrasts, a strong warming filter tends to create the impression of heat—a barren white rockscape might take on the heat of a desert; an unexotic North Sea beach may have the feel of a tropical shore. In other situations light brown or even sepia filters can help to evoke the warm golden glow of summers past—ideal for a nostalgic shot of a veteran car or an old country cottage. But remember to exclude things that might look strange in sepia. Again, it is also important to be sparing in your use of filters—people will soon get bored if all your pictures are brown.

Cooling filters are slightly harder to use, perhaps because blues are generally less attractive in pictures than

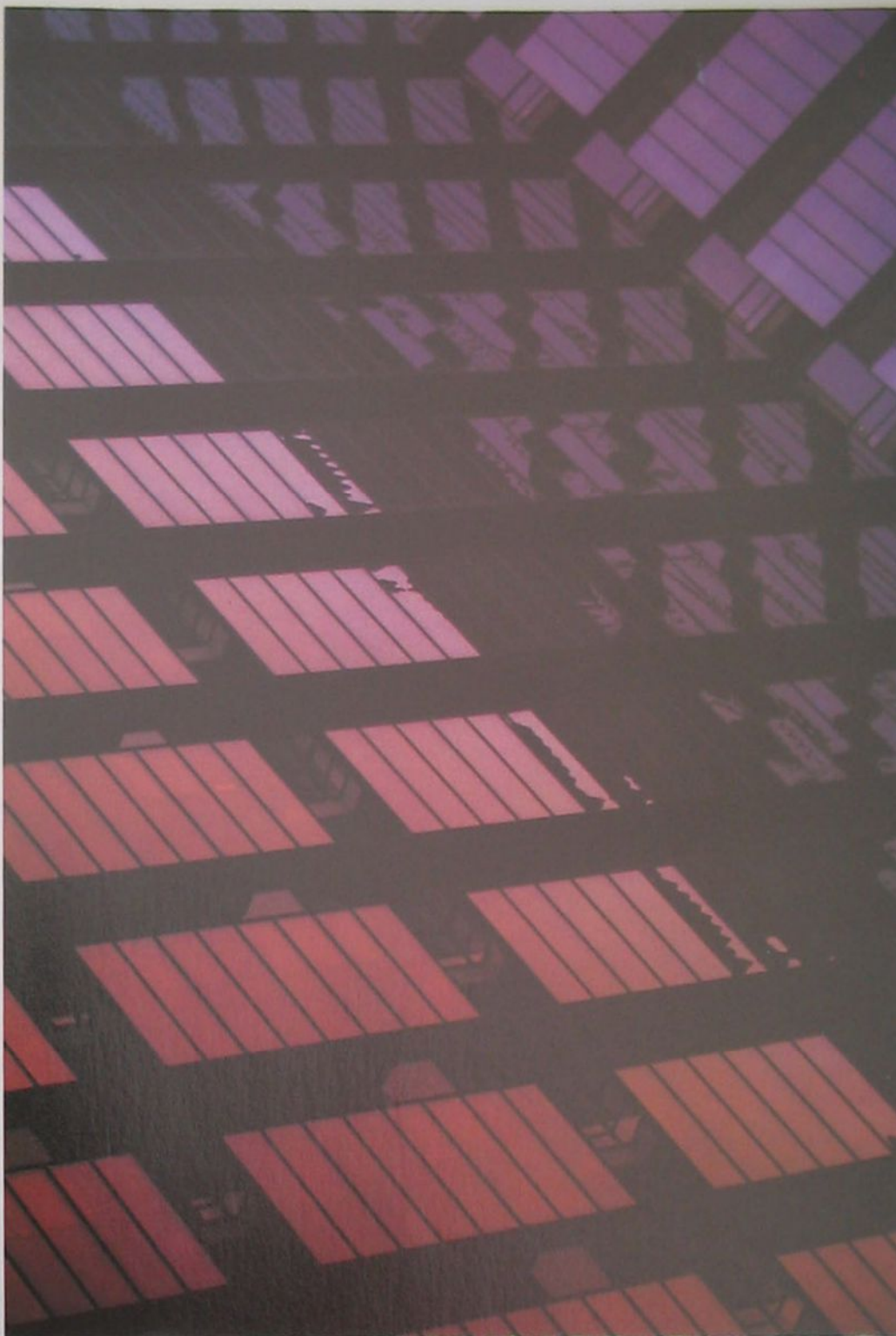
warmer colours. Nevertheless, they too can be useful creative tools. A standard technique in misty weather, for instance, is to use a warming filter to take away some of the blueness (see page 2167). But sometimes, particularly in heavy mist over water, you can create a more unusual picture by using a cooling filter to emphasize the blueness. Although clearly not realistic, the result may have a deep, shining, dreamlike quality. Similarly in snow scenes, where there are no recognizable colours to upset the effect, you can use a blue filter to accentuate the blue and create an impression of coldness. But again it is important to remember that because you are colouring the whole image, the effect can look odd if the picture is anything but very simple—any colours, such as yellow, will generally look unpleasant with a blue cast.

Taking cooling a little further, you can use a deep blue filter, combined with a polarizer and a stop or two under-exposure, to mimic the 'day for night' effect popular in early movie making—when filters were used to give an impression of night in a daytime shoot. Any highlights in the picture are muted and take on a blue cast—the sky should

Purple haze Simple subjects are most amenable to filtering. Here, a graduated filter turns a lone figure in a snowscape into a moody and effective study

Office block Since this abstract scene was monochrome, two graduated filters were fitted. Both were angled to match the overall composition

Obelisk Special effects filters have been overworked and results can be dull, but here the star-crossed streetlamp nicely complements the floodlit obelisk



John Sims



be a deep navy blue—while the contrast range is also reduced to give an impression of a moonlit night. This can be particularly effective in wooded areas or on a tropical beach with palm trees framing the foreground. If the sun is included in the frame, it can sometimes look like a bright full moon.

Cooling and warming filters are not the only filters available for adjusting the colour balance in a picture. There are many other colours—indeed, any colour you care to choose. Each of these can be, with imagination and a light touch, used to manipulate the colour of a scene to achieve a certain effect. But the number

of occasions on which these more usual colours are appropriate is far more limited, because casts in these colours are much more disturbing than either warm or cold casts—they are not associated with any natural lighting.

Filters must be chosen very carefully to match each subject, and there are no general rules. But a few examples may give an idea of the possibilities. You can subtly reduce the colourless look of snow scenes, for instance, with a very pale magenta filter. A pale magenta filter can also put a bit of colour in insipid looking brickwork. A strong magenta filter, on the other hand, can be used to



Bridge If there is a definite horizontal break in the middle of the frame, you can use a two-coloured filter—here red and blue—but the effect is rarely subtle

Racing the moon With a deep blue filter and underexposure, you can create a 'moonlit night'. To complete the effect, you can sandwich it with a slide of the moon

With the right holder, graduated filters can be manoeuvred so that only a small part of the frame or virtually all of it is filtered. The graduated transition zone prevents any hard, obvious lines.

Landscapes, cityscapes, seascapes and many other outdoor pictures frequently include a large area of sky. If the sky is weak and pale, it tends to weaken the whole picture. Sometimes you can frame to exclude most of the sky from the frame. But where you cannot, or do not wish to do this, you can use a graduated filter—either a neutral density to darken the sky and emphasize the clouds, or a filter to put colour in the sky—with the transition zone aligned with the horizon.

Normally you would choose the colour to suit the sky and retain the existing mood, but one of the attractions of graduated filters is that you can put a wide variety of colours in the sky to create a different mood or effect. A heavy brown or tobacco filter, for instance, could be used to create a dramatic stormy look on a dull, cloudy day. Shooting into the sun through an

give an aura of glamour to cities at dusk. The filter puts a little colour in the sky and grey buildings and helps to reduce the colour differences between various light sources.

Because of the psychological associations of the colour, shots through a red filter tend to have an air of tension or oppressive heat. Consequently, many photographers who wish to create this kind of mood—especially in city shots—have resorted to strong red filters, giving pictures in which highlights are red and shadows are black. Shots like this are now something of a cliché and their impact is reduced. Nevertheless, the approach does work occasionally. If you do try this kind of shot, remember that detail tends to be lost and only strong dark shapes show up. So keep to very simple, perhaps silhouetted, shapes or shoot on a misty day when a few dramatic shapes loom out of the mist.

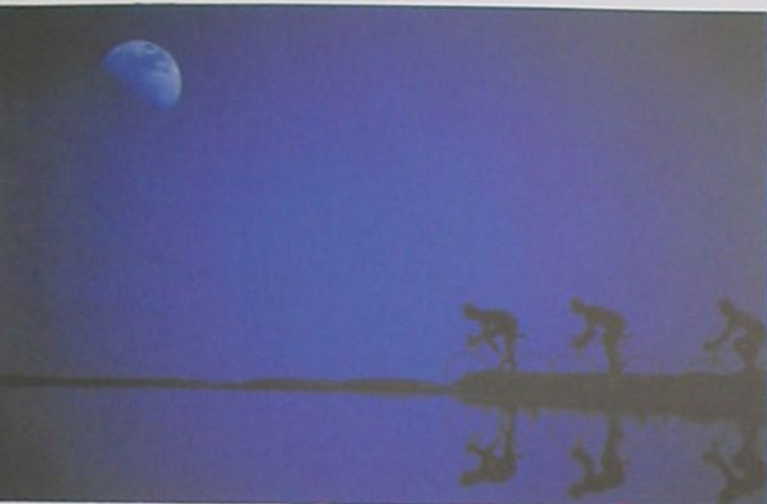
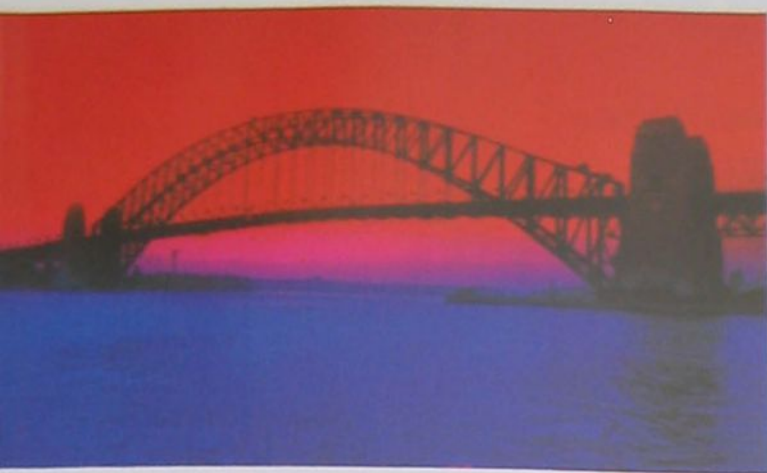
Except perhaps for silhouettes, strong filters should be avoided with portraits and shots including people. Most people have a very strong image of skin colour and any unnatural colouring tends to look very unpleasant. Perhaps the exception to this rule is female nudes because photographs long ago abandoned 'standard' treatments in order to find a new way of looking at a 'traditional' subject. Consequently, we have been exposed so much to female nudes in outlandish situations and colours that even the weirdest colouring no longer seems strange. But precisely because of this constant exposure, strongly filtered nude shots need particularly good composition if they are not to look dull.

Although there clearly are times when strongly coloured filters can be used to create an attractive shot, their value is generally limited because they colour the whole picture. While an all-red or all-green picture might seem unusual and exciting at first, the effect soon palls. Perhaps the most useful creatively of all filters, therefore, are graduated filters.

Promenade On a dull day when the sky is weak and pale, a strong graduated filter—here tobacco—can make all the difference, creating a dramatic, stormy mood in a normal seaside scene

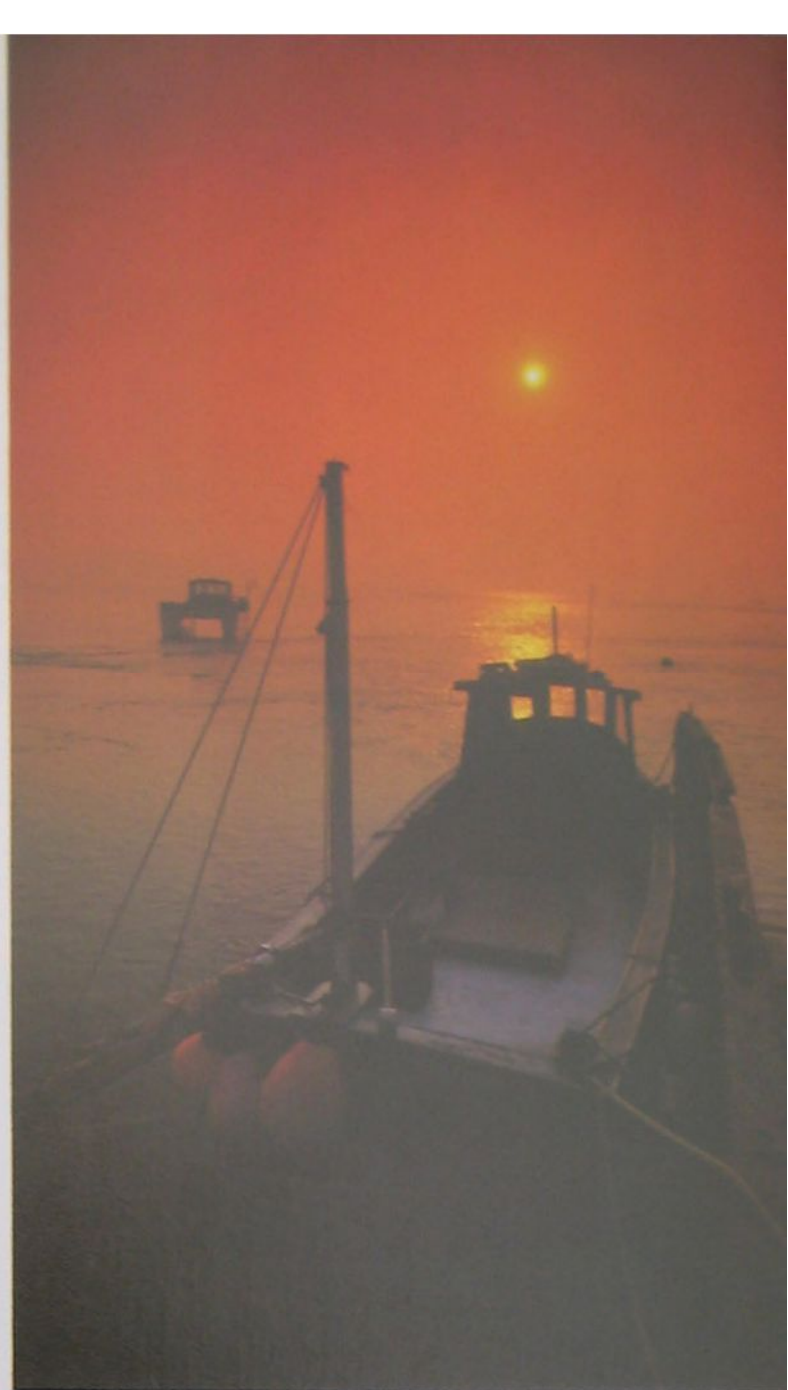
Skier Multiple image filters are very popular but only with the right subject do they have anything but novelty value. Here, with a simple, dynamic subject the multiple image creates a feeling of action and movement





Smack at sunset *If sea and sky are dull use an amber graduated filter to create an artificial sunset—this is effective when you shoot into the sun. But the foreground must be interesting*

Nigel Snowden



amber graduated filter, you can create a sunset effect.

Photographers tend to use graduated filters only to compensate for a weak sky, but there is no reason why they cannot be used for other purposes. In a cityscape, for instance, the background buildings might look pale and unexciting—a graduated filter in a colour in sympathy with the stonework might help to complete the picture or create a particular mood. If the foreground is pale and weak, on the other hand, you could turn a graduated filter upside down. A snow scene might benefit from an inverted pale magenta graduated filter; a tobacco filter might improve a shot across parched ploughed fields or a cornfield. Indeed, there is no reason why you cannot hold the graduated filter in any place or at any angle to put colour in a weak area of the picture—although usually only horizontal alignments look natural. But it is important to choose the colour of the filter to suit the subject and avoid using unnecessary extremes.

With a little care, you can combine two graduated filters in the same picture to achieve even more interesting effects. You could, for instance, use a grey and a blue filter overlapping over the sky so that the sky gradually darkens upward from the horizon: a pink and a blue could create a sunset effect. Alternatively, you can combine the filters in opposition so that one affects the sky and the other affects the foreground. This is particularly useful where the main point of interest is just a narrow band across the centre of the frame—such as a line of trees or a pier at the seaside.

Sometimes you may want a very marked transitional zone between the two filters: at others you may need a less distinct transition. You can control the nature of the transition through your placing of the filters and your choice of lens and aperture. With a wide angle lens and a narrow aperture, the transition tends to be fairly abrupt; with a telephoto and a wide aperture, the transition tends to be smoother.

Improve your technique

Using an old camera

Even though you can buy old box and folding cameras for just a handful of change, they are still capable of producing reasonable pictures. However, for best results they need a little extra care in use

Courtesy of the Kodak Museum



Visit any shop that sells antiques and bric-a-brac, and the chances are that you will find a pile of old cameras for sale. Cheap, simple cameras have been produced by the millions in the past, and after a few years' use, their owners often dumped them in a dusty corner in favour of a newer model, or a different hobby. But even so, many of these box and folding cameras can still produce a perfectly good picture, if you are prepared to spend a little time experimenting with film and exposure.

When buying an old camera at a shop or market stall, do not be tempted to spend a lot of money simply because the camera is old. Most box cameras are made of thick cardboard, or thin metal, and were originally very cheap to manufacture and buy. Some were even given away free with soap powder. Because so many were made, and they are virtually unbreakable, there are still many in existence, and the true value of a box camera is very small. Do not be taken in by tales of 'scarcity value'—one or two types of box camera are unusual, but you are unlikely to find these in a junk shop.

Folding bellows cameras are better made, and often have elegant leather cases, so these are worth a little more.

Apart from price, pay special attention to film size and type when buying an old camera. Take care with cameras which use *autographic* film. These are easily spotted because they have a long slot at the back, through which the owner could write a short message on the film. The special roll film that made this possible ceased to be made in 1935, and the slot now only lets in light and fogs the film.

Virtually all cheap amateur box and bellows cameras used roll film, and this was at one time made in many sizes. The only size that is still widely available is 120, though in some countries you may still be able to buy the occasional roll of 828, 620 or 127. Try to avoid using a camera that takes any film other than 120, or you may have trouble obtaining supplies for it.

620 film is identical in width and backing paper information to 120, but is wound on to a spool that has a smaller core and narrower flanges (this made possible the design of more compact

cameras). If you already own a 620 camera, you may be able to press it into service by winding 120 film on to an old 620 reel, in total darkness. Even so, you still need a second, empty 620 spool to act as a take-up spool in the camera, and few discarded box cameras ever contain more than one empty spool.

If you are uncertain about the film size that your camera takes, open the back of the camera, and look on the inside of the door. The size is usually printed or

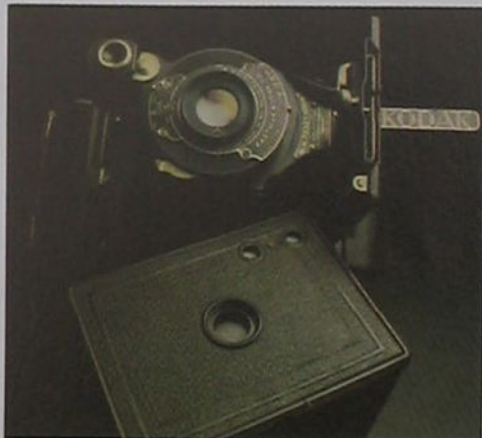
stamped on to the camera at this point. All old roll film cameras have a red window at the back, through which the photographer can read the frame numbers on the backing paper. Make sure that this ruby window is not missing or damaged, or your film will be fogged.

Check that the shutter opens properly: most box cameras have a very elementary self-cocking shutter, and this has only one or two moving parts to cause trouble. Consequently, even the oldest box camera shutters generally still function perfectly. If the camera has a mechanism for altering the size of the aperture, this usually consists of a simple steel strip, punctured with three different sized holes. This mechanism is unbreakable—though prone to rust—and so needs little attention.

Folding bellows cameras are usually more complex. First of all, open the camera by pressing a catch or button near the front. Sometimes this catch is prominent, but it is often concealed under the camera's beautiful, gold-embossed, leather-like Naugahyde covering. Poke around until you find a slightly raised or worn part of the leatherette, and then press. The camera front will spring open, and the baseboard can then be swung down and locked into place. If the camera does not open smoothly, do not use force, or you may do permanent damage. Try and find out what is jamming the camera shut (this also applies to folding the camera up after use).

With the baseboard extended, pull out the lens and the bellows along the guide rails. A spring clip should lock the lens panel at the full extent of its movement. Now open the back of the camera, and hold it up to the light, to check that the bellows does not leak. Any pinholes that admit light can be covered with black fabric tape. Finally, check that the shutter works at all speeds—usually just 1/50 second, 1/25, and B or T.

Picnic snaps Even the simplest box cameras (top left, bottom right) can produce reasonable quality results. Bellows models (bottom left) usually have more controls. But avoid cameras that use obsolete film sizes (top right)



Basic options Exposure and focusing control varies widely between models (above). Many box cameras have no exposure controls at all, and this means using neutral density filters with modern films in bright light



Dave King





Checking bellows Looking through the camera back with the lens towards a light reveals any pinholes in the bellows



Shady view The images in the simple viewfinders are not very clear and often need shading from bright light

Using the camera

All these simple cameras were manufactured at a time when film and other photographic materials were much less sophisticated than they are today. They were designed to take pictures in bright sunlight, and to produce black and white negatives which would be contact printed rather than enlarged. You should

bear this in mind when you are using one, and choose your subject matter and technique accordingly. For example, black and white film has a lot of inherent exposure latitude, so box cameras are fitted with few exposure controls. With negative materials, this is not a problem, but it makes the use of colour transparency film, with its comparatively

Spool sizes Although they look very similar, these spools are for different film sizes, and are incompatible. However, 120 and 620 use the same width of film, and if you cannot find any 620 rolls, 120 can be wound on to the 620 spools in a darkroom and used instead



narrow exposure latitude, considerably more difficult.

For a trial run, load the camera with slow colour print film, or with black and white. The manner of loading varies from model to model, but generally you must first pull out the film winding knob. This frees the camera back or film insert, and you can then open the camera and remove the empty film spool. Place this on the take-up side, and put the new spool of film (with the gummed paper sealing strip completely removed) where the empty spool was. Pull out a length of backing paper, with the black side facing the lens, and thread it across the film plane to the take-up spool. Insert the tongue of the film into the spool, wind on a couple of turns and close the back of the camera. Push in the winding knob, and wind the film to the first frame. This may seem to take a long time, because the winder is not geared, and the paper leader is about half a metre long. Carefully watch the ruby window, and you will see letters or dots going past. Eventually an arrow appears, and this indicates that the first frame is imminent, so wind more slowly. The first frame is indicated by a number one, so stop winding when this is centred under the red plastic.

If the window has a cover, swing this into place. If it does not, cover it with black fabric tape. Modern film is so sensitive that very bright light can penetrate the red window, and pass through the thick backing paper to fog the film. In these conditions only uncover the window to wind film, and only then in the shade of a tree or your own body, or else in subdued light indoors.

The viewfinder on simple box cameras usually consists of a mirror and two lenses. There is either a single viewfinder that swivels, or two separate ones—one for vertical pictures, and one for horizontals.

If you are used to using an SLR, your first reaction is probably to press the viewfinder to your eye. You will see nothing like this. Instead, hold the camera at your waist, and look down into one of the two glass windows, and you should see an image of what is in front of the camera. In bright light, it may be necessary to shade the camera with a hand to get a good view.

The lens on a box camera is usually of the simple, uncoated meniscus variety, which is prone to a wide range of lens aberrations and, sometimes, low contrast. To avoid flat, washed-out pictures, it is probably best to obey the old rule about the sun coming over your shoulder, or at least from the side, unless the lens is deeply set in the camera. Take care that sunlight does not fall directly on the lens itself, or you will probably get a very disappointing picture.

If the camera is of the bellows type, it may have a focusing scale, which you should adjust according to your estimate of the camera-to-subject distance. Box cameras have either no focusing mechanism, or a fairly rudimentary one.

One model, for example—the 'All Distance Ensign'—has a lens that slides in and out along a tube. Around the lens are printed the words 'Push for places, pull for faces', which is fairly self-explanatory. A few other cameras have a sliding bar, fitted with one or two supplementary close-up lenses. Pulling the bar slides one of these into place in front of the lens, and brings nearby subjects into sharp focus.

In the absence of any of these sophisticated features, just avoid photographing subjects closer than three metres from the camera.

Shutter mechanisms are equally simple. A lever or button operates the shutter, which is just a small hole pierced in a metal plate that swings in front of the lens, or behind it. Some shutters swing down for the first exposure, then back up again for the next. Others are of the press-and-release type, so that the same up and down cycle is completed for each exposure.

All shutters give the film a fairly long exposure—of the order of 1/25 to 1/60 second. So you must take great care to hold the camera steady during the exposure, or your pictures will be ruined by camera shake.

Most box and folding cameras also have a time exposure device—a tab, often marked 'T' which must be pulled out before the shutter is released. This then holds the shutter open until the tab



Write off Autographic cameras have a window through which you could write on special film—now they just leak light

is pushed in again. With fast modern film, setting the camera to 'T' leads to gross overexposure, except in very dimly lit interiors, or outdoors at night.

Once you have mastered the basic mechanics of the camera, make an exposure test. Take a lightmeter reading using a hand-held meter, or the TTL meter in your usual camera, and then

make an exposure with your box or bellows camera. If this has no adjustments, you need only keep a record of the frame number, the weather conditions, and the exposure indicated on the meter (an exposure log). If the shutter speed, and/or aperture can be changed, make a note of these, too, and take a series of exposures at different settings. From this test, you will be able to determine the best exposure for any kind of light.

The most likely problem is overexposure. With negative films, one or even two stops of overexposure do not matter unduly, but if the film is very heavily overexposed, you should tape a neutral density filter over the lens to cut down the amount of light reaching the film. You might also be able to tape a piece of card over part of the shutter aperture—not only would this cut down the exposure, it would also increase the effective shutter speed.

An exposure log has a second function, besides that of helping you to establish the correct exposure. It also helps to save film by preventing double or blank exposures. It is easy to forget whether or not you have wound on when the camera has no interlock between shutter and film-wind.

If you want to use your camera to take big 6 x 9 cm transparencies, you will need an accurate assessment of shutter speed, focal length and aperture.

Checking focal length, aperture and shutter speed

To make accurate exposures you will need to know the focal length, aperture and shutter speed of your camera. First, work out the focal length.

Place the camera on a table in a darkened room. Open the back of the camera, and lock the shutter open on B or T. Now place a lighted candle exactly one metre from the lens, and hold a piece of white card behind the open back of the camera. You should see an image of the candle flame on the card. Move the card back and forth until the image is at its sharpest, then measure the distance from the card to the lens in metres. This is the distance 'u'. The focal length is found following the formula below:

$$F \text{ (focal length)} = \frac{1}{(1 + \frac{1}{u})}$$

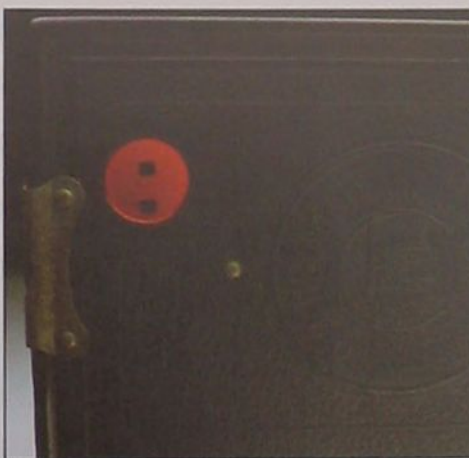
This equation gives an answer in metres.

To work out the aperture, take a piece of clear film (such as developed and fixed 35 mm black and white film that has not been exposed) and scratch or otherwise mark a scale in millimetres on to it. Place this inside the camera, against the lens, and, with the shutter locked open, measure the diameter of the aperture. The *f*-number is equal to the focal length divided by the aperture diameter.

The shutter speed cannot be measured directly, but there is a simple way to check it—use the method shown on pages 2218 to 2221.



Red window Arrows and then dots appear in the window before the first frame. Further frames are indicated simply by



numbers—there is no mechanism to stop you winding further. It is often best to cover the window when not in use

Projection lenses

Lenses for enlarging negatives and projecting slides are very simple, but they must be designed to meet the particular demands of projection

Tessa Musgrave



Although modern high quality camera lenses seem to represent the ultimate in optical design and technology, they are not suitable for every photographic purpose. For both enlarging negatives for printing and for slide and movie projection, special lenses are usually needed.

Camera lenses can sometimes be used for both enlarging and projection and the subject often raises some controversy. But while the camera lens is designed to focus a large and usually distant subject on a small piece of film, enlarging and projection lenses must do precisely the reverse. So the requirements are very different.

Enlarging lenses

One of the principal reasons why a camera lens cannot usually be used for enlarging is the difference in correction for aberrations. A camera lens is corrected for subject-to-lens distances of many focal lengths. An enlarging lens, on the other hand, must be corrected for subject (the negative)-to-lens distances of only one focal length. Nevertheless, a

few camera lenses may be correct over a broad enough range for enlarging.

In the days when enlarging lenses were used only for black and white work, it was only necessary to make very simple corrections for chromatic aberration. While the eye responds most strongly to yellow-green light, printing paper responds only to blue light. So when the enlarger is focused visually, it is the yellow-green light which is focused. To give sharp prints, then, the lens needs only be corrected so that the yellow-green light is focused at the same place as blue light—a simple achromatic correction (see page 1406).

Unfortunately, a basic achromat is not adequate for colour printing. Indeed, it is not really good enough for printing on orthochromatic black and white paper. On colour prints, any chromatic aberration, both axial and lateral (see page 906), will show up clearly. Modern enlarging lenses therefore include extra correction elements to keep this to a minimum.

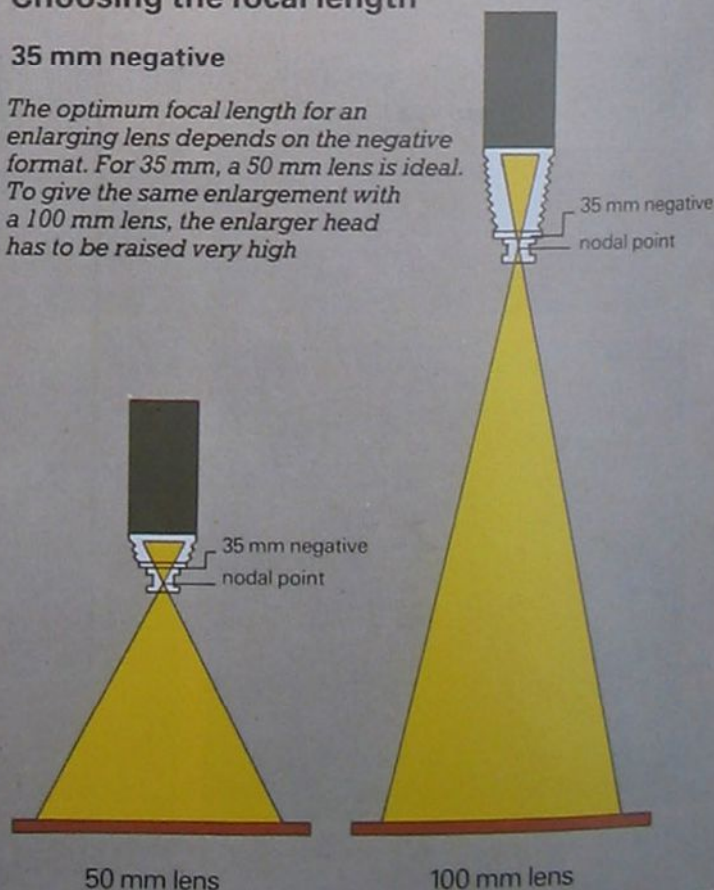
A further difference between camera lenses and

Projection lenses have fewer elements than modern quality camera lenses. But for colour work, both enlarging lenses (centre) and projection lenses (outside) must be properly corrected

Choosing the focal length

35 mm negative

The optimum focal length for an enlarging lens depends on the negative format. For 35 mm, a 50 mm lens is ideal. To give the same enlargement with a 100 mm lens, the enlarger head has to be raised very high



enlarging lenses concerns the field shape—that is, the plane in which the image is sharp. For enlarging, the field must be flat at the typical negative-lens-easel (conjugate) distances, otherwise pictures will be sharp in the middle and out of focus at the edges, or the other way round. Some camera lenses give a flat field only with distant objects—with nearby objects, the field is slightly curved. Although this problem can be overcome by stopping down to increase the depth of field, the designers of enlarging lenses aim to achieve the flattest possible field to allow wide apertures and short exposure times.

Enlarging and camera lenses can also differ in two other respects. The glass elements of the camera lens are often cemented together. In the heat of an enlarger, especially a condenser enlarger, the joints may be damaged, so cemented joints are usually avoided.

Focal length

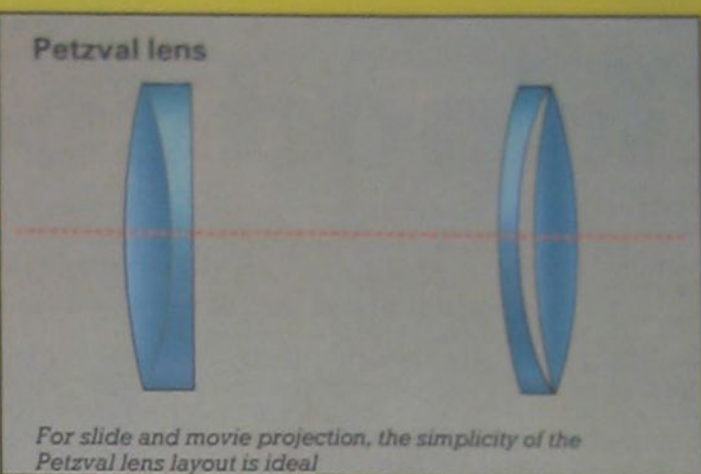
The choice of focal length for an enlarging lens is necessarily something of a compromise. The focal length must be long enough to include all

the negative at big enlargements, but short enough to give reasonably big enlargements without an inconveniently long throw from the lens to the easel. If it is too long, you may find yourself having to turn the enlarger head round and projecting on the floor even at fairly small enlargements.

The generally accepted compromise is that the focal length of the enlarging lens should be slightly longer than the diagonal of the negative being enlarged. Usually, people use a 50 mm lens for 35 mm negatives, a 75 mm for 6 × 6 cm and 100 mm for 6 × 9 cm. Essentially, then, the enlarging lens has a focal length similar to the 'standard' camera lens for the negative format.

Projection lens

Like enlarging lenses, projection lenses differ from camera lenses in the way they are corrected for chromatic aberration. Projection lenses need to be corrected to suit the colour response of the eye and the spectral characteristics of the projector lamp. And again like enlarging lenses, they do not include any cemented elements because



of the danger of heat damage. Again, like an enlarging lens, a projection lens must give as flat a field as possible so that the screen image is sharp all over. Unfortunately, slides in glassless mounts do not always lie flat. In the warmth of a projector, the film may 'pop' and become slightly bowed so that it is impossible to bring the whole of the image to focus together. There are projector lenses designed to remedy this situation and these have a slightly curved field. But these can do nothing for a slide that starts off bowed but flattens when it warms up.

The particular demand

upon lenses for projection is that they provide a bright image over a wide screen. This means, not a wide angle lens, but a very wide aperture. This is particularly important for movie projection because of the big screen magnifications involved and the projector shutter cuts out half the available light.

The lenses most commonly used for both movie and slide projection are the Petzval type (see page 1406). Petzval lenses are fairly simple to make and are ideal for a relatively inexpensive wide aperture lens. They can be made to give apertures even larger than $f/2$.

However, although they give a very sharp image at the centre, definition falls off towards the edges of the image and there is considerable vignetting. This means that to give a picture which is evenly illuminated and uniformly sharp, either the focal length of the lens must be increased to narrow the angle of view, or the aperture must be restricted. For 35 mm slide projection, a focal length of 85 or 100 mm is common with an aperture of $f/2.5$ —the 85 mm lens has an angular field of only about 28°. For a focal length any shorter, a narrower aperture would have to be used.

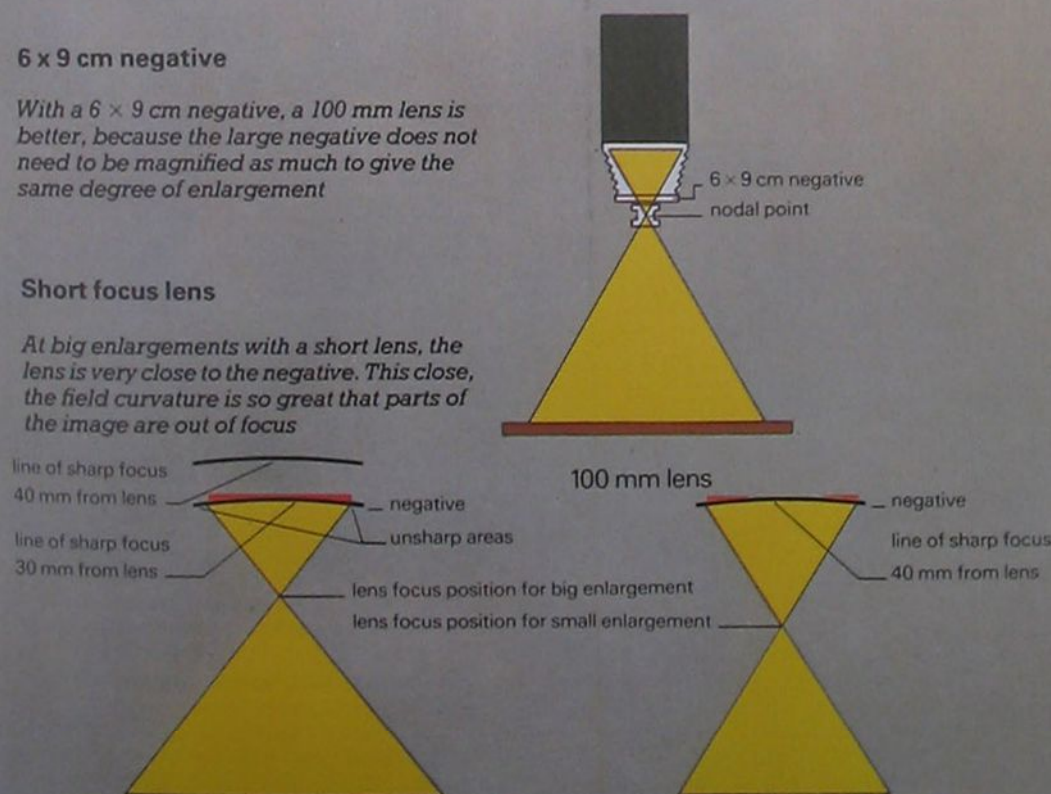
All the glass elements of a Petzval lens are positive—that is, converging. So the glass surfaces can be more gently curved than in lenses with negative elements because the divergence of a negative element has to be overcome by a strongly positive element. It is thus easier to correct a Petzval lens for spherical aberration, coma and oblique spherical aberrations.

6 × 9 cm negative

With a 6 × 9 cm negative, a 100 mm lens is better, because the large negative does not need to be magnified as much to give the same degree of enlargement

Short focus lens

At big enlargements with a short lens, the lens is very close to the negative. This close, the field curvature is so great that parts of the image are out of focus



Tripod construction

All tripods are built with the aim of supporting the camera, but there are great differences between them in terms of the strength of support they offer. So just what factors make some models much better than others?

The ideal tripod would weigh virtually nothing, take up hardly any space and yet be as steady as a brick wall. Furthermore, it should be so versatile that one should be able to support a heavy camera at any height and at any angle, even overhanging another object, and it should take no time at all to set up.

Not surprisingly, practical tripods fall short of this ideal, and every tripod is a compromise of weight, bulk, rigidity, versatility, convenience and cost. Many of these criteria work in opposition to one another, but there are ways of constructing tripods so as to emphasize one particular quality. The basic features of tripods are covered on pages 448 to 451, along with the many small tripods found in camera shops. The more advanced photographer, who may have a speciality in photography, may well require a more substantial unit. Before making any choice, it is worth looking at some aspects of tripod construction more closely.

Tripod legs

The legs are probably the most important feature of any tripod. The leg material, its cross section and its dimensions are crucial to a good tripod design.

The stresses on a tripod are generally very low. Usually, it only has to support the weight of the camera and lens—although some of the heftier tripods can take the weight of the photographer if he wants to stand on the leg locks to gain a little extra height. There is little point, therefore, in designing a tripod to withstand high stresses. Instead, it is designed to move as little as possible under low stresses—such as the slight movement of the shutter release or the effect of a breeze.

So tubes are generally preferred for the legs on the more expensive tripods not because they are inherently more rigid than the channel section legs found on many cheaper tripods but for a number of other reasons. With no corners, for instance, tubes are far less liable to damage—and to cause damage—than channel section legs. And it is more convenient to arrange screw connectors on a tube.

The material used should be rigid but not brittle, and unfortunately rigidity and brittleness usually go hand in hand. In addition it should be free from vibration, or at least have a short damping time.

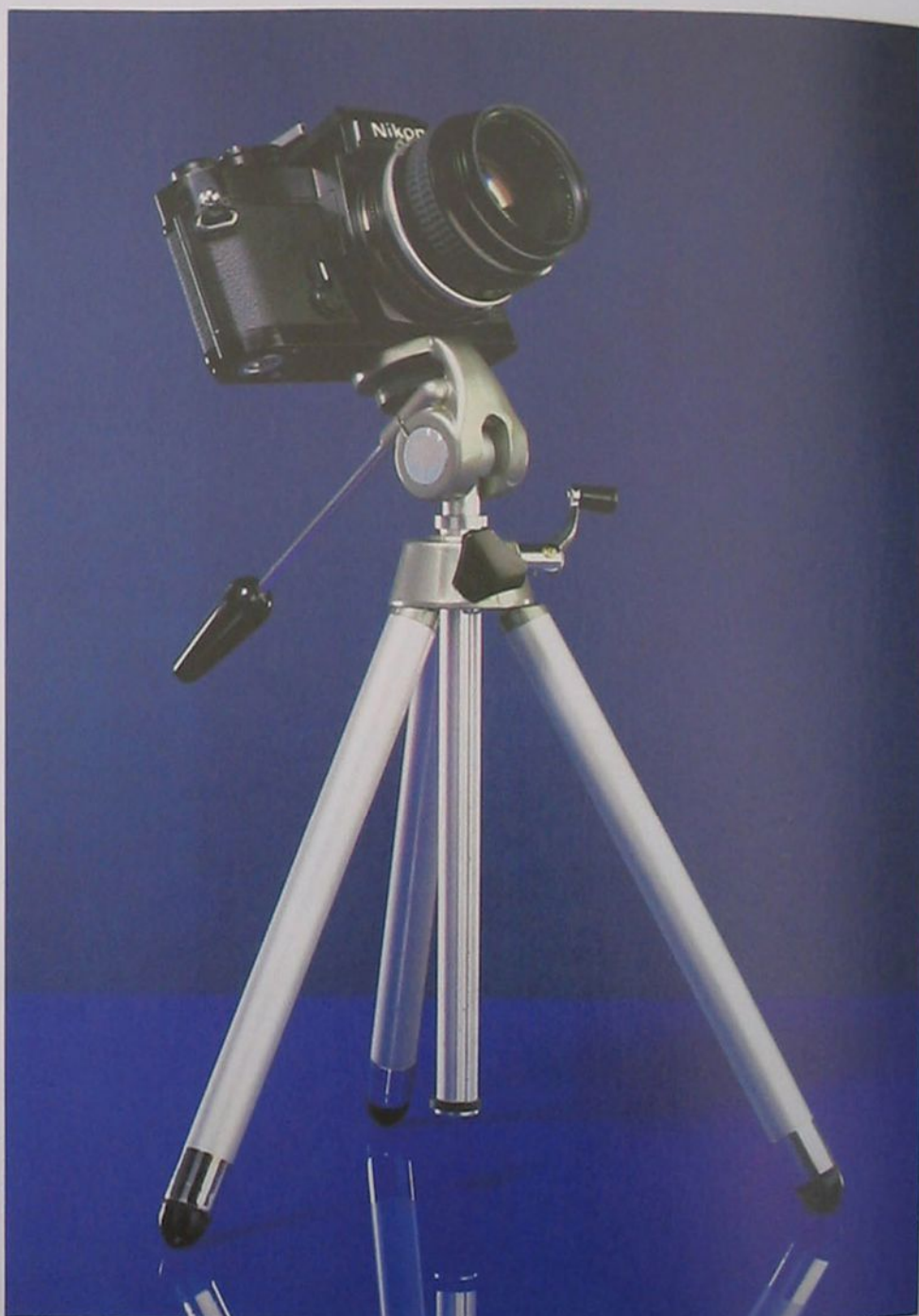
In the early days of photography, tripods were almost always wooden, but this is not really satisfactory. Although it

damps minor vibrations very quickly, wood is unsuitable because it tends to bend very easily—unless the legs are very thick and heavy. So all modern tripod legs are made of metal. The best material is duralumin—an alloy of aluminium and copper, with small amounts of other materials. Almost all tripods legs use this material, though some actually claim to be 'pure aluminium'—which would be quite unsuitable. Dural is rigid yet light

Inherent stability A three-legged platform, adopted as the standard camera support, is stable on a wide range of surfaces

compared with steel, which tends to vibrate more in any case.

On many tripods, the legs are enamelled or given some other chemically-bound finish. Often, this is not simply to make the tripod look better, but to improve its stability. It does this by helping to damp out minor vibrations. A





A studio stand provides an extremely stable platform for professional cameras, and is mobile over level surfaces

core of damping material would serve to damp vibrations even more but would make the tripod unnecessarily heavy.

The design of the legs is just as important as the material. Even if there are no joints, and the legs are unbroken tubes, the tripod has its weak points. Structurally the idea of a tripod is excellent—the principle of triangulation is vital. A triangle of wood, for example, is very much more rigid than a square, which needs a diagonal strut to prevent it from distorting under stress. But the material of the tripod legs is bound to flex a little, so ways have to be found of preventing this.

Flexure in legs can be considerably reduced by using double legs, with two tubes side by side. The Multiblitz tripod on page 2253 is of this type. When the leg is bent, the leg on the inside of the bend is in compression while the other is in tension, so the two effects cancel each other out. Unfortunately this makes the leg more cumbersome, so many tripods use single legs.

Stays or struts halfway down the legs will both help to prevent flexure and damp down vibrations. But they will not overcome bad leg design, and some tripods with no stays perform better than those with poor design and stays.

Leg locks

The basic rule of tripod leg design is that the fewer leg sections, the better. But all portable tripods must fold down to some extent, so leg locks are inevitable. A common design on some professional tri-

pods is the collet, a ring at the bottom of each section which compresses a pad on to the leg when you do it up. These are simple in design but can be awkward to use. Those on the upper legs must be done up tightly to prevent the lower leg sections from twisting as you do up their collets. And in cold weather, or if they are left done up for some time, they can be hard to undo. The pads can also wear out in time.

More attractive in some ways are the quick release clamps, usually to be found on channel section tripods. The pads in these wear down, and as the flip lever operates a cam, there is no adjustment possible.

For long life and security, positive screw clamps are probably most suitable. Any wear in the pads which bear on to the legs is taken up by the screw, so they do not wear out. On circular tube section legs there is little danger that the legs will distort with overtightening as long as the pads are contained within a ring which preserves the tube shape.

Many tripod legs are quite inconvenient to set up and close down. One design which has advantages in this

respect is that of the unique Benbo tripod, which has the larger section at the bottom, rather than the top of each leg. This means that the leg is sealed against mud, water and grit, and also that adjustment is quite easy—you can unclamp the leg, move it to the position you want and clamp it up again with one hand. This is particularly valuable for outdoor use, such as for nature photography where the feet of tripods usually get dirty and the terrain often very uneven. With a conventional tripod, dirt on the lower legs can get trapped in the locking mechanism, making it gritty and hard to operate.

Whatever locking system is used, the larger the bearing surface which clamps the sections together, the better.

Tripod boss

The central boss which holds the legs in place does not have to withstand great loads, so massive construction is unnecessary. Bosses are usually made of either die-cast aluminium alloy or injection-moulded nylon. People sometimes feel that the plastic appearance of nylon means that it lacks durability, but it

The Benbo Professional is among the most versatile and revolutionary tripod designs. The twin section extendable legs and reversing centre column are clamped by a single locking lever, so that even the most awkward recess (right) can be shot



Roger Payling/tripod courtesy of Kennett Eng. Co. Ltd.



is less brittle than a die casting. This means that an accidental knock or even overtightening of the bolts holding the legs is unlikely to shatter it.

An important test for any tripod is to grasp the boss firmly and try to twist it horizontally. Some tripods have a small bearing area between the boss and the legs, often allowing considerable play. This play is present in all tripods, but should be at a minimum.

The centre column is a feature of almost all tripods. In many this simply slides up and down, but in others it is geared, and can be moved up and down by turning a handle. Gearing has a number of advantages—it allows small

variations in height, and can be more secure than a simple sliding column, which may be important if you have a heavy camera or lens. And it allows you to continue looking through the camera while you make adjustments, which may not be easy with a sliding column.

In all tripods, the higher the centre column, the greater the risk of movement. Tripods which gain height by using long legs rather than a long centre column are usually preferable.

A useful, though unusual, feature, is a tilting centre column. Up to about 15° movement in any direction allows the final precise levelling of the camera to be done here, rather than at the head.

Manfrotto Not all tripods will go as low as this, but it is a useful feature, allowing greater choice of viewpoints—the tripod is also more stable at this height

Much more common is a reversing centre column, which can be removed and reinserted so that the tripod head is under the boss. This is invaluable for close-up work at low level.

Also available on some tripods is a lateral extension, which you can screw on to the boss to carry the tripod head out sideways. This allows much greater versatility in positioning of the camera, but is unnecessary if you usually do only studio portrait work, for example, where

A reversing centre column (below, Stitz tripod) enables you to photograph low down, while a lateral arm (right, Manfrotto) shifts the camera sideways





Osawa A dolly readily converts this portable tripod for movie cameras



Multiblitz The double leg design makes this unit very stable for its height

the camera is rarely required to be at a strange angle.

Again, the Benbo tripod is unique—it has a curved bolt in place of a boss, allowing the legs and centre column to be clamped firmly in any position, offering extreme versatility.

Weight and performance

It is popularly believed that great mass is essential for a good tripod. But this is not always true. A well engineered design can achieve good results without resorting to weighty components. All that mass does is to give the tripod greater inertia, which means that it is less liable to be moved by small knocks, but other factors are also important.

A heavy weight hung from the centre column of a light tripod can, for

instance, improve matters by increasing inertia and damping down vibrations.

Vibration time is no guide by itself to tripod quality, though. Some tripods damp vibrations very quickly but are very susceptible to movement, while others are quite rigid yet vibrate on a minute scale for a long time. When taking pictures, rigidity is most important. A crucial test is to put a camera with a long focal length lens—preferably longer than 400 mm—on the tripod. Look for image movement as you focus. Steadiness under these circumstances is a good guide to what will happen when the shutter operates and the mirror flips up. With a lens as long as 2000 mm, virtually no tripod will hold it rock steady.

There is often comparatively little weight difference between a large professional tripod and a flimsy amateur unit. Any tripod at all is inconvenient to carry around, so it is often better to buy a large unit than a small one.

Tripod heads

Photographers disagree over the relative merits of pan and tilt and ball and socket heads. If you are buying a pan and tilt head, make sure that it will allow the camera platform to be tilted vertically. On a ball and socket, look for a rotating base which allows you to tilt the

camera vertically without needing to unclamp and twist the centre column so that the vertical channel is in the right place (see page 450). The ball should be more than 25 mm in diameter. The disadvantage with ball and socket heads is that the friction clamps tend to be 'all or nothing', with no friction to help support the camera as you move it around. There is a risk of moving the camera slightly as the lock is applied.

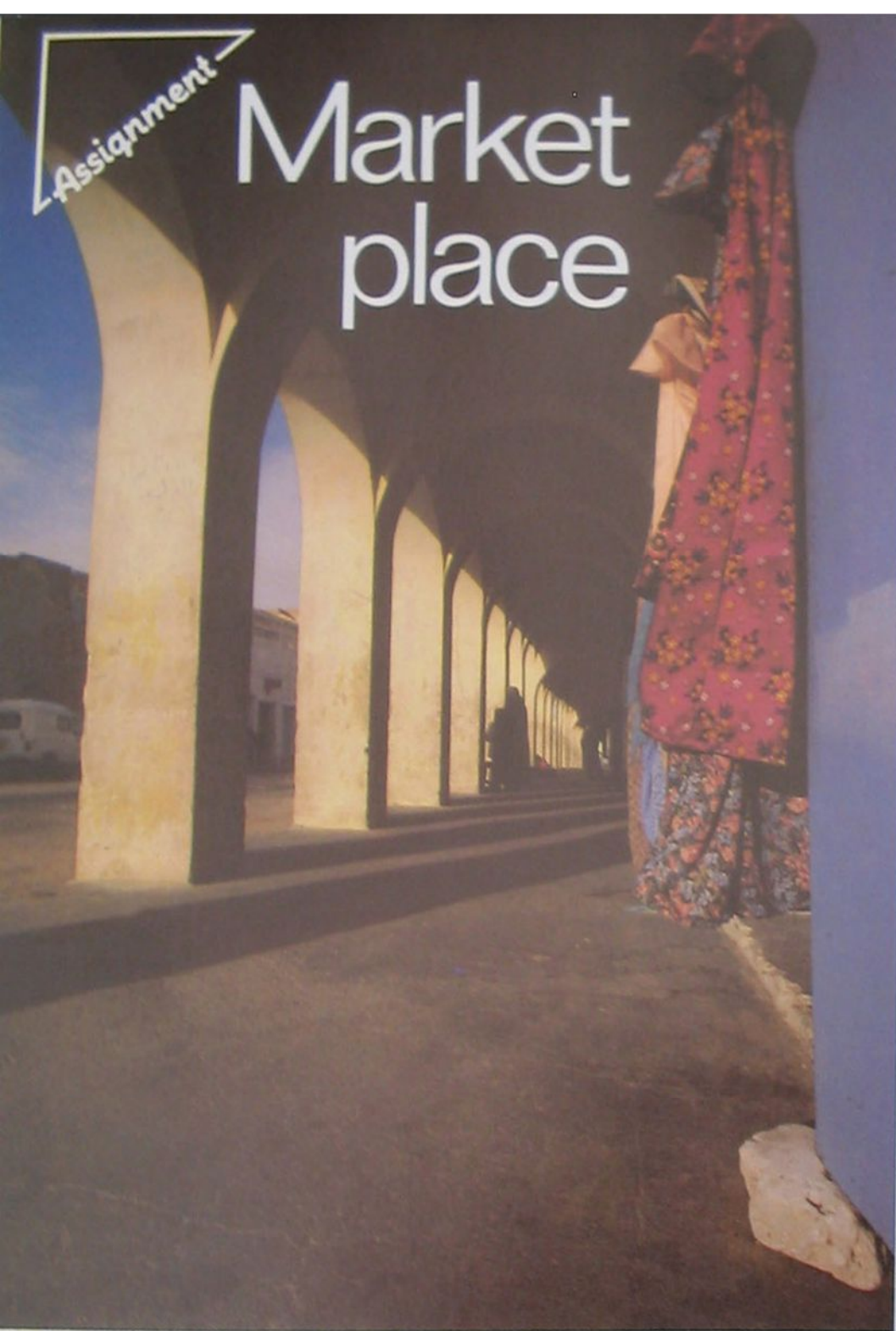
The camera platform should be reasonably large and covered with a material which does not allow slippage yet has a certain amount of give, so that you need not overtighten the locking screw. Thin cork or hard neoprene rubber are ideal—thick, soft rubber can allow the camera to move.

The size of the head is not critical, but usually the larger heads can accommodate all the various features, such as spirit levels and tilting platforms. Too large a platform might be a hindrance to focusing a short lens, or to viewing through the viewfinder, but it might be desirable for stabilizing the camera when using a long lens.

Pan and tilt head Tripod heads are fitted with either a $\frac{1}{4}$ inch or a $\frac{3}{8}$ inch thread. Some heads have a quick release baseplate and boss which can be interchanged to give either of the two thread sizes



Market place



Archways Early in the morning, before the market was fully set up, Tim used a 35 mm lens to take in this row of arches, deliberately framing the colourful fabric in the foreground.

Blue doors When the sun rose high in the sky making the light harsh, Tim concentrated on subjects in shadowed areas to give more saturated colours



Tim Beddow

A market place is an ideal photographic location in any country, but Timothy Beddow shows that an Algerian market has particular charms to capture on film

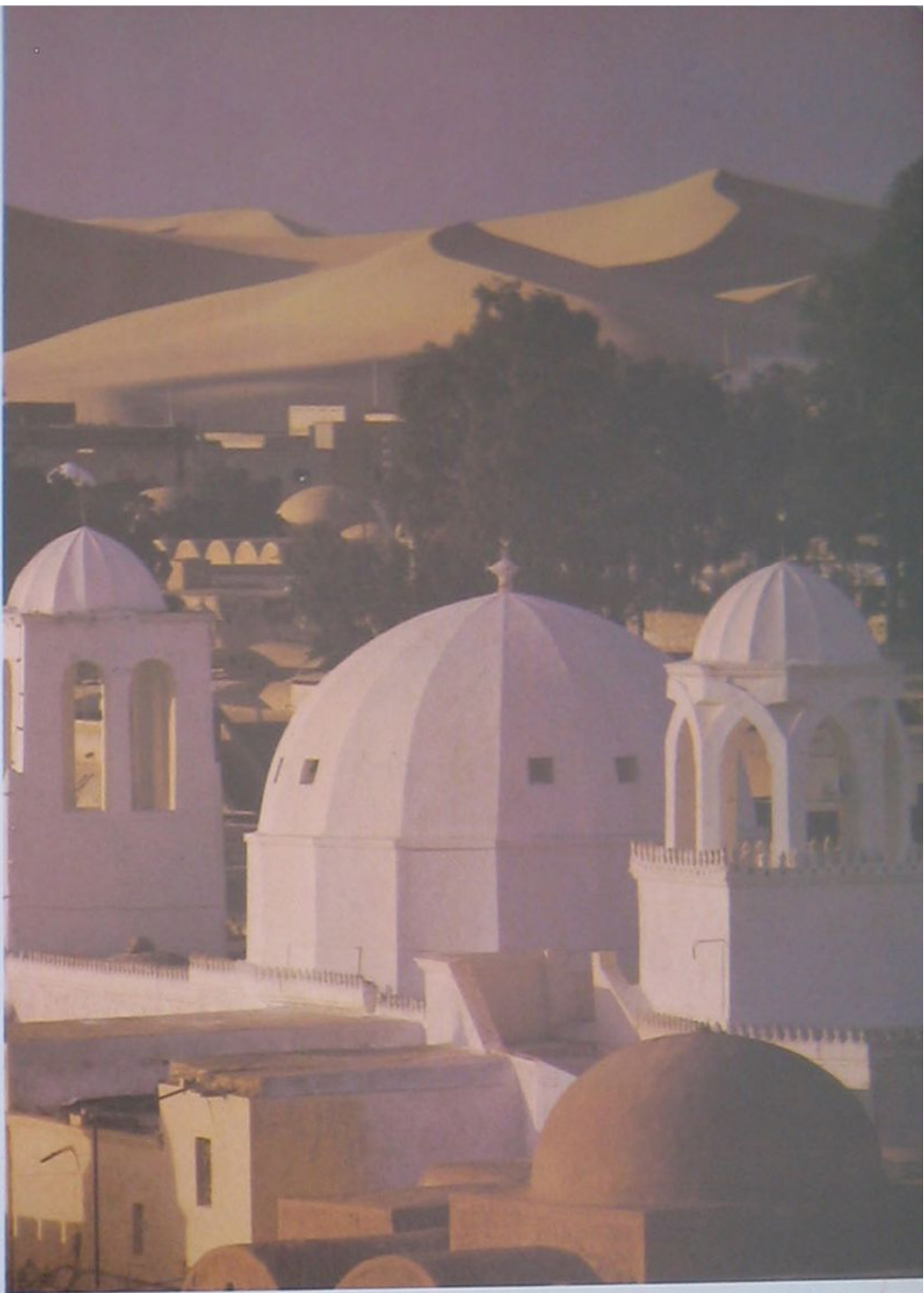
Few photographers have the chance to travel far afield in order to spend month after month taking photographs, but for photographer Timothy Beddow a commission to illustrate a book on the Sahara desert entailed a total of 15 months in North Africa with only a two month break in the middle. One of the things he photographed during this marathon session was a market place in the town of Eloued in Algeria.

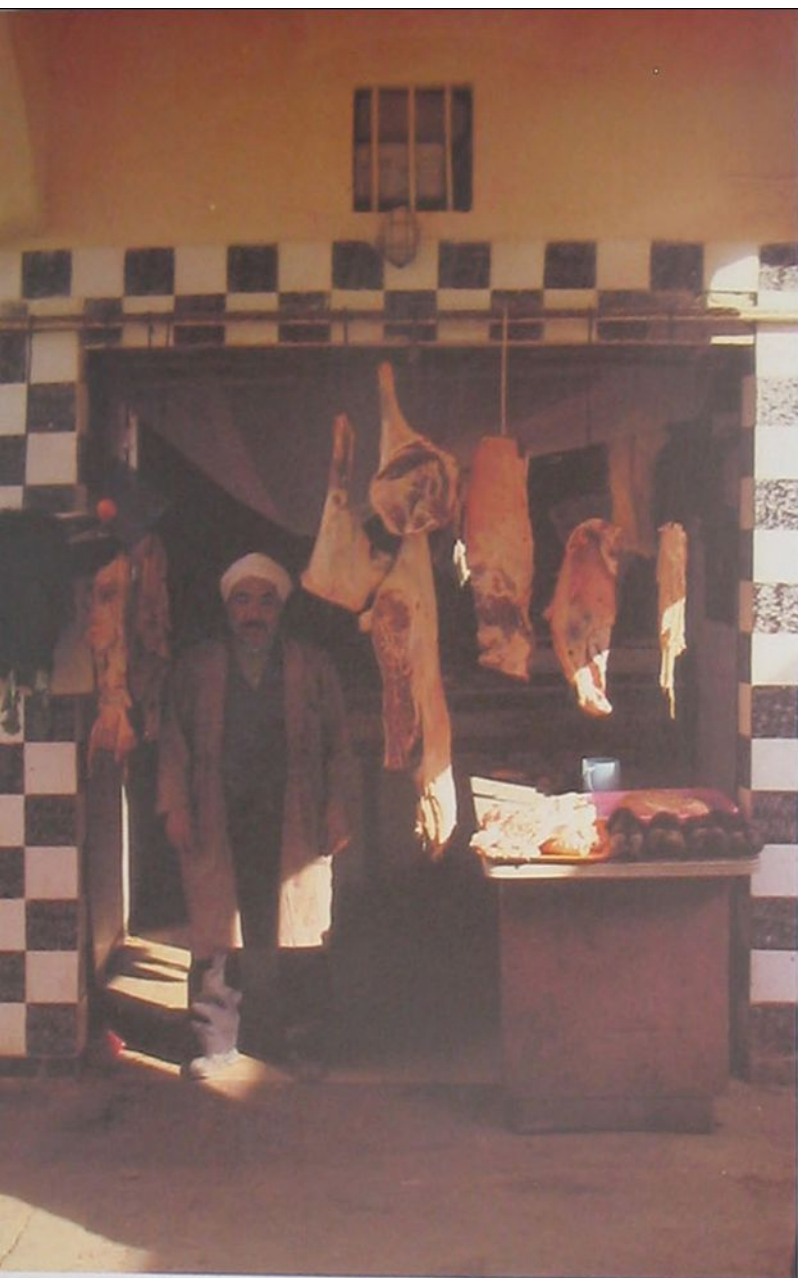
To cover all aspects of the market meant getting up at first light to witness the activity involved in setting up the market stalls. But before he ventured

into the thick of these preparations, Tim visited the top of a mosque on the edge of town. He had noticed this location on the previous day and obtained permission to use it as a vantage point. From this height he obtained an impressive view of the domed rooftops which are characteristic of the town and also included the dunes of the desert looming in the background. The early morning light which enhanced the appearance of the scene is particularly valuable in this part of the world because for most of the day the sunlight is so harsh that all colours become washed out and all subtle



Bag of spices A 20 mm lens was useful for wide shots of the merchandise—like this colourful range of spices. **Domed rooftops** Using a 105 mm lens from the vantage point of a mosque, Tim started with an overall shot of the town, bathed in the early morning light. **Stall holder** This shot was the result of getting on friendly terms with the subject before bringing out his camera





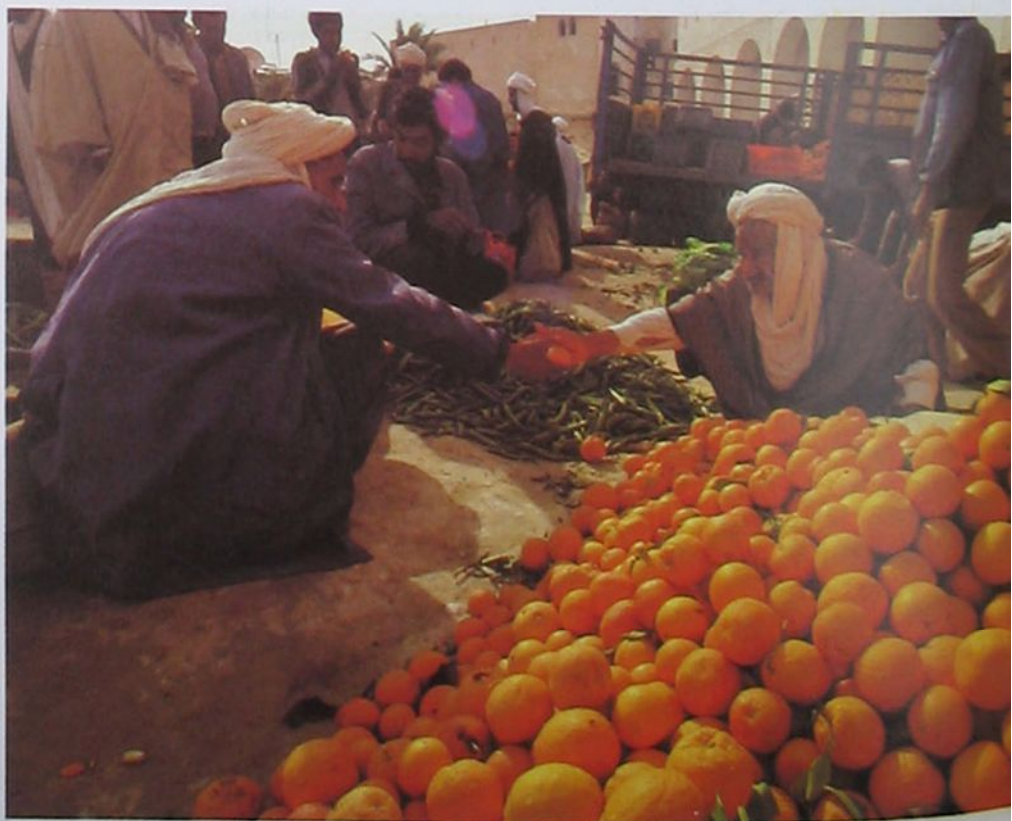
Tim Beddow



Butcher After getting the approval of the butcher, Tim took advantage of the soft, shadowed light and used a 55 mm lens for this portrait. **Sheep** The pattern of the sheep tied together made another good subject but Tim tried the shot from several different angles before deciding that this one worked best. **Oranges** The early morning sunlight made the colours look richer. All of these shots were taken on Kodachrome 64

modelling effects are lost. And by late morning, the heat is so intense that it is hard to continue shooting.

As the market became established for the day, Tim moved around the stalls before he started shooting. He explained, 'You have to gain their confidence before you can start shooting—you can't just walk up to people and stick a camera in their faces.' Even once he started actually taking photographs, he took care to look for a gesture of assent before photographing someone—or else he kept his distance and used a telephoto lens. After a while Timothy found that people forgot about his presence so that he could go about his business without attracting too much attention.



What went wrong?

Still life

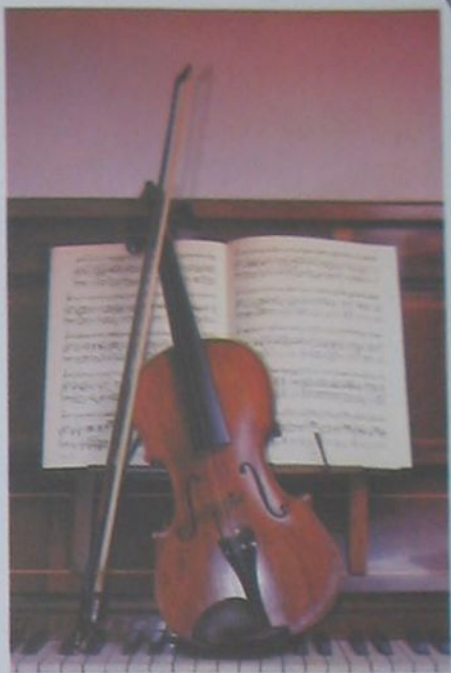
'I feel still life photographs are difficult to do really well,' commented Homer Sykes on looking at these pictures. 'One can't help thinking of those perfect photographs by Edward Weston.' So what was Homer's verdict?



The photographer has made several simple errors. There is no central point of interest—the eye does not immediately go to either pumpkin. I also find the white area in the top right hand corner of the picture annoying. This could easily have been framed out by moving the camera slightly to the right or, better, by simply adding another pumpkin. Neither of the two more prominent pumpkins are really sharp.



This photograph is really pretty uninteresting. It works well as a simple record shot. But simple record shots are boring regardless of the subject. When photographing sculpture try different lenses. A long lens will compress the subject into the background, while a wide angle lens from a low angle will slightly distort the sculpture but could make the photograph visually more interesting. Walk around to find different backgrounds.



This is rather pleasant. But it does not work as well as intended. The main criticism is that there is no point of interest. Are we meant to look at the violin or the music? The lighting, which in still lifes is extremely important, is dull—available light with some fill-in flash. It would be better to light the violin alone, throwing the music into shadow and closing in to lose the piano keys—there is a lot of wasted space.



Perhaps the most interesting of the photographs on this page, this shot of smoked mackerel is well observed. The exposure is correct and the colour is good—but there is not enough depth of field.

The most distracting thing about it is the white space, in the top left and particularly in the top right hand corner of the photograph. This is exactly the same mistake as in the pumpkin picture. The remedy is the same—move in a little closer to frame out the space or better still add some more mackerel to fill in the space.

The central point of interest is clearly the two larger mackerel that have been put at an angle to lie on top of the others. This is a good idea, but it would have worked better had the photographer positioned them so that we could see their heads. I would then have focused on their eyes and made a feature of the heads.

It is a very good idea if you are doing a lot of location still life photography to take a small tripod with you. This not only allows you a longer exposure and therefore more depth of field, but more importantly it allows you time to compose the picture carefully. Still life photography should not just be about snapshots.



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Channel crossing



A day trip from England to France—from Dover to Calais—is a typical subject for holiday snaps. We asked George Wright to show how the results could be made more than just snapshots.

A trip across the English Channel has become such a popular and easy thing to do that some people even make the crossing for regular shopping excursions. This ease of access to a foreign country made us wonder about the opportunities for a photographer—it seemed ideal—a quick, inexpensive trip which offered a look at a foreign country, a new range of subjects and the stimulus created simply by travelling.

All too often, though, the photographic potential of short trips is wasted—snaps, rather than seriously taken shots seem the inevitable result. But there is no reason why anyone should not accommodate good, interesting work within even a short trip, wherever you happen to go. With this in mind, we asked professional George Wright to see what he could come up with when out shooting as a day-tripper rather than as a full-time professional on assignment. George immediately reflected the view of any enthusiastic photographer, 'I find that just being in a foreign place gives me a fresh view of things so that you notice photographic potential in the most everyday subjects.'

Even the ferry crossing itself turned out to have photographic potential.

Ferry Even before he boarded, George used his 300 mm lens for this shot of the ferry. **Window display** Details can convey much about a place's character



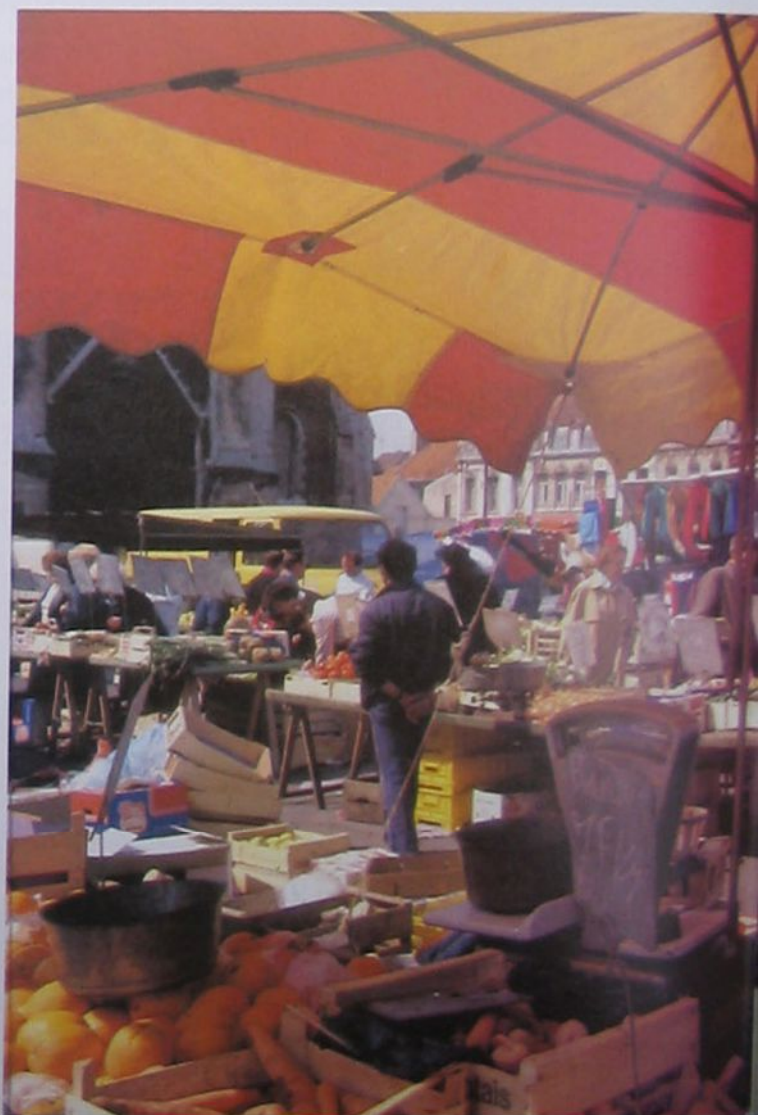
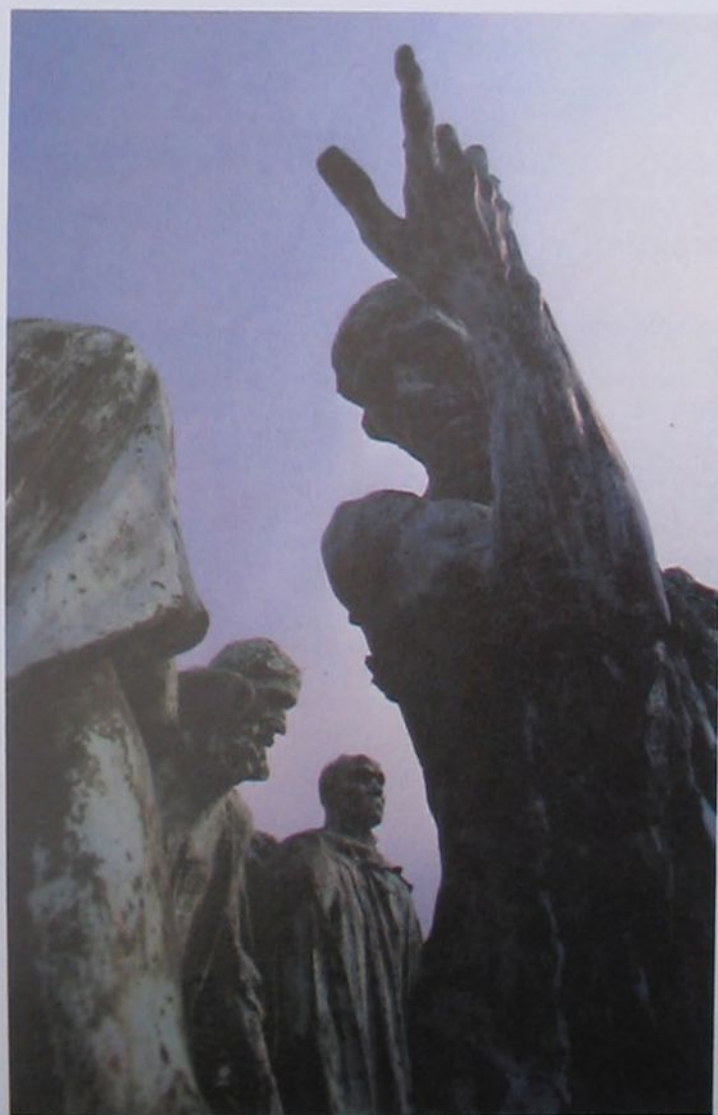
Before boarding, George pulled out his 300 mm IFED Nikkor lens and took a few shots of the vessel that was to go to Calais. 'I love photographing busy harbour scenes—especially if I have a telephoto lens handy to close in on the ships and the activity.' Once on board and under way George found further subjects in the passengers and on details of the ship's superstructure. The shot of the passengers sitting in the stern is an example of the sort of shots George took during the journey.

After arriving at Calais, and wandering around, he saw the potential in the town's central park as well as in the street scenes and the busy market. 'Parks and markets are the sort of places to head for if you want to try and capture the atmosphere of the place', George explained. 'Usually people are too involved in what they are doing to care about your camera or even notice you at all'. However, George also took quite a few photographs while just wandering around the main streets and backstreets. 'Here you find people relaxing in streetside cafés or simply pausing to talk—this is another opportunity for getting some characteristic shots.'

Walking the streets, George also



Old men Out in the streets of Calais a 105 mm telephoto proved ideal for candid. *Burghers of Calais* A 20 mm lens created an unusual view of this well known Rodin sculpture





Doorway George did not just walk around the centre of town—he also found plenty of subject matter while exploring many of the smaller backstreets

The market is always one of the best places to look for local atmosphere and colour, but George had to rise early to capture this at its busiest and best



YOP Advertisements are distinctive features of a place, but for this shot George waited for the old man to pass by and provide an amusing counterpoint

On the ferry During the voyage George found plenty of things to photograph—like these passengers. All shots were taken on Kodachrome



George Wright

noticed other particularly French details—advertisements or window displays. But he added, 'When you are thinking in terms of making a broad record during your travel don't forget the principal sights. The Rodin sculpture, *The Burghers of Calais*, is a case in point—though it must have been photographed a million times, it's always worth making your own interpretation. I tried to produce an original shot of this statue, framed so the town hall is visible in the background.'

Even with the more mundane subjects, it is easy to fall into the trap of shooting only the obvious, clichéd images of French life, and George was always looking for a fresh approach. But he found it essential to leave his companions for a while and wander around the town undistracted for a few hours.

Audio-visual EQUIPMENT

Synchronized sound and vision is the exciting feature of A-V presentation. But each type of machine provides a different level of sophistication

The distinction between a simple slide show and an audio-visual (A-V) presentation is vague. Generally, a well-structured slide show with a coherent commentary is well on the way to being an A-V, but genuine A-V tends to be a little more involved.

At its simplest, an A-V consists of a planned sequence of slides accompanied by a planned sequence of sound. A single projector can be used with a hand-operated slide change unit to synchronize the slides with a spoken or recorded commentary, or a piece of music. Increasingly, however, two or more projectors are used. Some professional synchronizing units can handle 128 or even 256 projectors, but two is the usual limit for the amateur.

It is possible to run a twin-projector show manually, but this requires considerable planning, concentration and timing sense. Advocates of manual presentations maintain that each showing is a performance, just as playing a piece of music, but there is an increasing trend towards automatic projection. In this, the control information that governs the changing of the slides is recorded on the same tape as the soundtrack which accompanies the pictures. In professional usage, all A-V presentations are automatic, because automation reduces the chances of failure. An added advantage is that the projectionist is free to enjoy the presentation, instead of being huddled over the projectors.

There are two types of manually operated systems: mechanical and electrical/electronic. The mechanical system employs two diaphragms or variable shutters in front of two projector lenses. These shutters are linked and controlled by a single lever, so that as one opens the other closes, giving a cross-fade effect. Slides are changed when the shutter is closed fully, so there is always an image on the screen. By modern standards, this system is crude. When used with wide-angle and zoom lenses, it gives a vignetting effect as the corners of the screen darken and then brighten during a fade.

An electrical/electronic system dims the lamps of the two projectors either electrically (via a variable resistor) or electronically (via a triac). There is a cross-over effect, with one light brightening as the other dims. There are no problems with vignetting, but whereas the mechanical system can use almost any pair of projectors, this system requires either a purpose-built A-V projector or modifications to existing projectors.

With either type of system, it is as well not to rely purely on memory when deciding when to change to slides. If either the pictures or the music runs out before the other, the result can be

Twin projectors with encoder and playback unit for automatic dissolves between projectors. Placing one projector above the other simplifies image alignment



Dave King/equipment courtesy of the Widescreen Centre



Dave King/equipment courtesy of the Widescreen Centre



The heart of the system *The Kodak Carousel slide projector forms the basis of most professional A-V presentation systems for single, twin or multiple projection*

Good organization *is vital to a successful A-V presentation, especially when using two projectors. All the slides must be numbered, with even numbers in one tray, and odd in the other*

extremely embarrassing. A simple way to avoid this is to use a stopclock and cue sheet. A more sophisticated method is to record the change cues either on the same tape as the soundtrack (easiest with a stereo reel-to-reel machine) or even on a separate cassette recorder. Variations in playing time are not likely to be significant over a few minutes.

When you buy a fully-automatic system, you can either choose all your equipment from one manufacturer or choose various components from different manufacturers. By choosing the first alternative, you will ensure that all the equipment you buy will be compatible, but the drawbacks are that you may have to keep a particular projector or other piece of equipment that you do not like, and that you may have difficulty in upgrading your equipment later. The second alternative means you must ensure that all the items of equipment are compatible. This you can do by asking dealers, but often they will not know the answers, so you will need to write to the manufacturers.

Usually, you need three groups of equipment: the projector or projectors, the tape deck and sound system, and the control unit (also known as *dissolve unit*, *program unit*, or *programmer*; some control units have a built-in tape deck).

Projectors

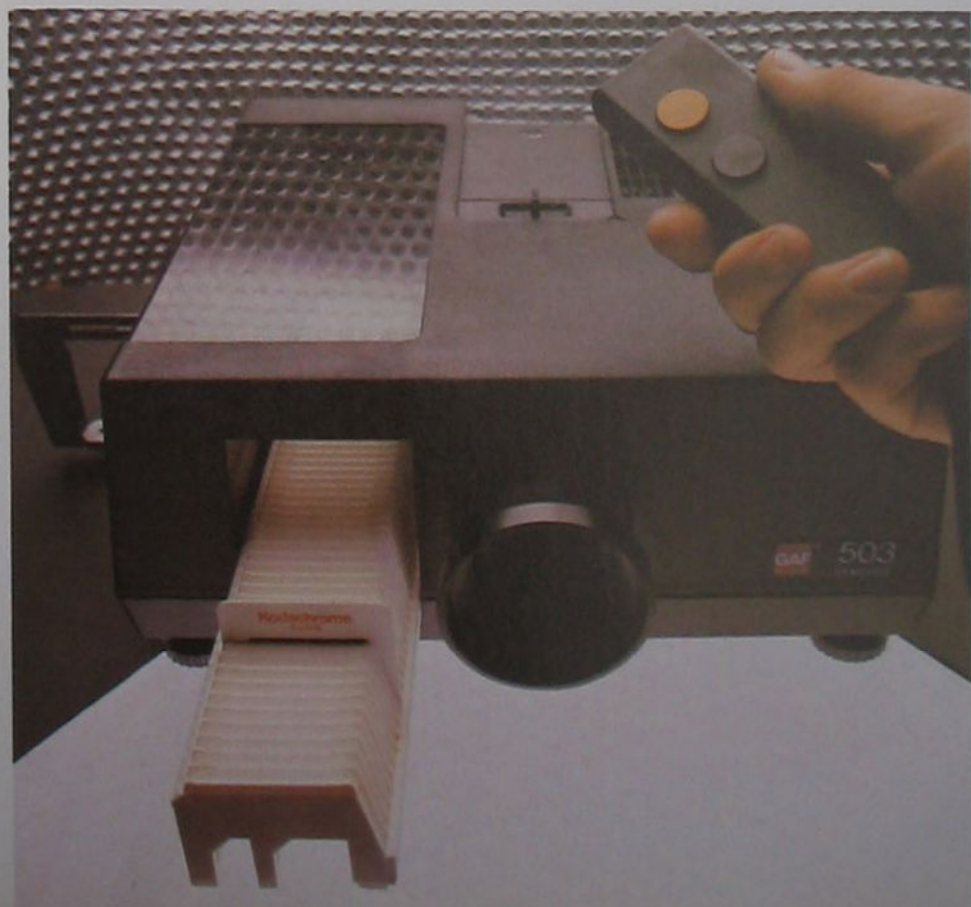
At the heart of the A-V system is the projector, which should perform several tasks. The projector should be able to accept the control information. Almost

all projectors capable of remote operation can do this if a simple change is required, but fades and dissolves (where the lamp is controlled) require either projectors designed to do this or a relatively inexpensive modification to ordinary projectors.

The projector should also locate the slide accurately. A 1 mm variation in positioning in the projector could mean a 50 mm variation on the screen. This is not significant on a single projector, but with twin projectors the result is that the

image jumps disturbingly about the screen. This may be particularly severe with poor quality slide mounts, which can cause a millimetre of slop. High-quality mounts are recommended, because they hold the film precisely.

The two lenses of the projector should be of the same focal length and type, or it will be impossible to align the two frames on the screen. Long focal length lenses are easiest to align, with standard lenses of 80 to 100 mm coming a close second; wide angle lenses are the most



Dave King/equipment courtesy of the Widescreen Centre

Remote control projector *Using just one projector you can learn the basics of A-V work before you go on to more sophisticated arrangements*



All in one A modified recorder with encoder, dissolve unit and separate amplifier. The recorder has an extra head for the pulses from the dissolve unit

difficult, because the difference in positioning of the two projectors causes *keystoning*. This effect is most obvious when a projector is projecting obliquely, and one side of the image is much larger than the other. When two projectors are used, a slight degree of obliquity is unavoidable, and with a throw of 10 m or more the effect is negligible.

The two projectors should also be of

equal screen brightness, and they should be reliable—a jammed slide is awkward, and if the tape continues to run and transmit instructions the results can be chaotic.

From these requirements, it is apparent that the best way to ensure you have a pair of matched projectors is to use two of the same make, and ensure they are good ones. This can be alarm-

ingly expensive, and it is far better to produce a good single-projector presentation than to attempt a more ambitious production using ill-matched or second-rate equipment. It is also a good idea to learn the basics of A-V production on a simple single projector set-up before moving on to more sophisticated equipment.

The tape deck/sound system

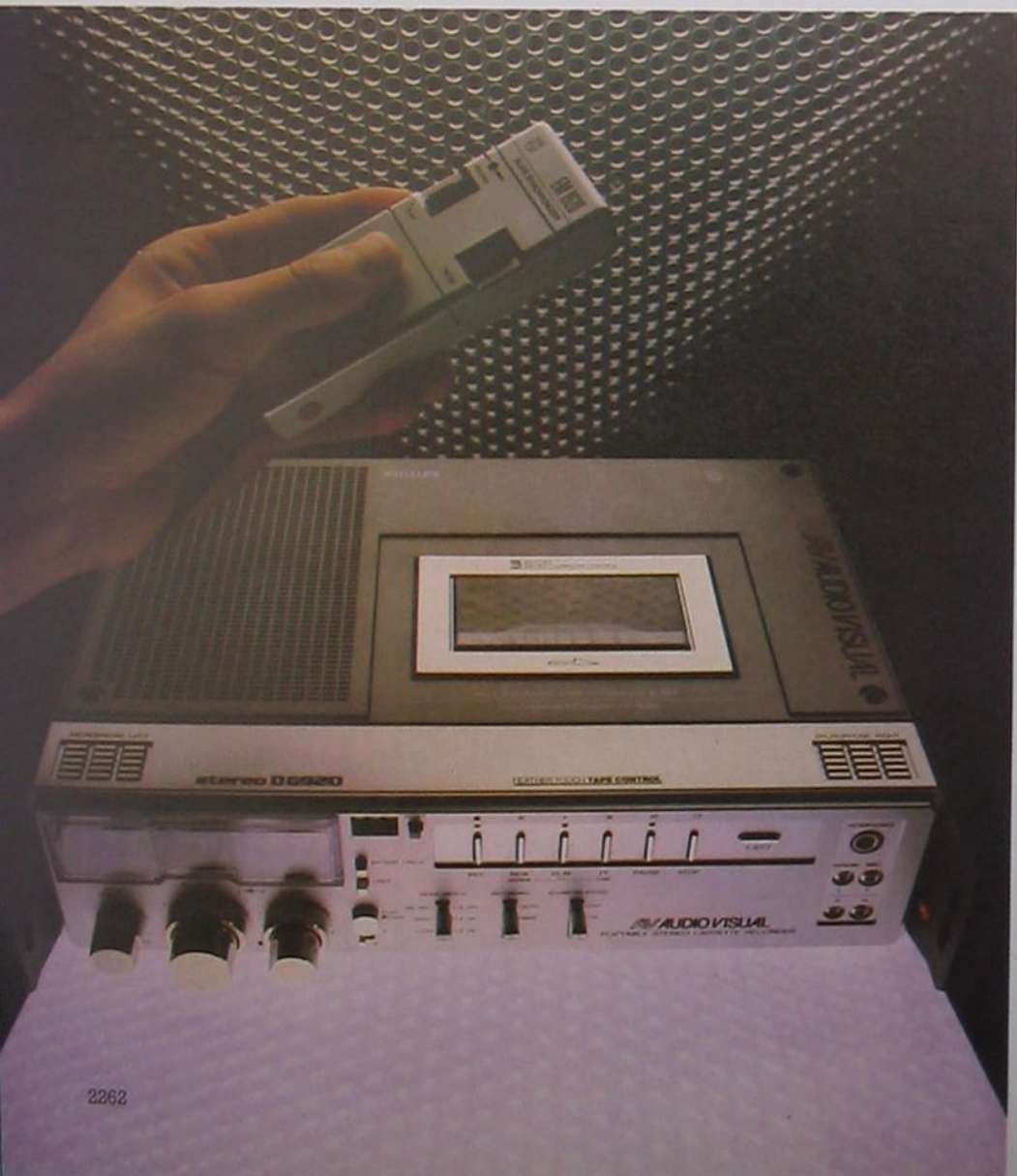
Traditionally, reel-to-reel stereo tape recorders were used, with the sound on one of the tracks and the control information on the other. Today, this is rarely done, and the cassette is all but supreme.

The way you record the soundtrack depends on your equipment and experience. Audio enthusiasts may wish to mix complicated tracks using two reel-to-reel recorders before dubbing the final result on to cassette, but others may be content with a simple musical soundtrack with occasional voice-over, recorded with nothing more than a record deck and microphone. Certainly reel-to-reel equipment gives high quality and more versatile recording, but for playback the cassette is quite adequate. Because of the low power of many cassette recorders, it is usually necessary to play back through a domestic hi-fi amplifier and speakers.

The control information is recorded on a separate track from the sound, so a second record/playback head is necessary. This is no problem with a stereo reel-to-reel machine, (though it does limit you to mono sound, because one track is being used for control information), but cassette machines need to be purpose-built (or modified) with an extra head so that each track can be recorded separately—with single head machines both tracks are recorded simultaneously. Remember, though, that you could record on a borrowed machine and play back on a single head stereo machine.

The control information is held in the form of pulses or 'bleeps'. For a single projector, where slide changing is all that is required, there is only one type of bleep. The frequency is fixed (though differing from machine to machine) and the duration is not particularly important, provided it is not so long that it initiates two changes.

For twin-projector control, different types of pulses are required to initiate fades of different durations or changes. There are three ways of encoding the information: by frequency variation, by variation of the length of the tone, and by using a continuous modulated tone. The first two types usually limit changes to



Purpose built recorder and encoder. This model plays in stereo but has an extra head for the signals for the dissolve unit, plus other useful A-V features

certain preset durations, while in the third the length of the cross-over is decided by the user.

Usually you can listen to the bleeps by connecting a speaker or headset across the control information channel, which may be useful to check that they all exist and are in the right places, but normally they are inaudible and serve only to actuate the changes.

The control unit

Once you are satisfied with your soundtrack and have made your selection of accompanying pictures, you can use the control unit to encode and record the slide-changing information alongside the sound. The full set-up consists of the projectors, the control unit, the tape recorder, and a handset or switch which both effects the change and records it. Trial-and-error is the only way to set the changes, and several attempts may be necessary before you are happy with the final result.

The way in which the change switch or handset works varies from machine to machine, and the only way to gain experience is to make a few trial runs—with the recorder off, say, while you experiment with the speed of dissolves and the length of time an individual slide stays on the screen. On most machines, it is possible to re-record only those changes with which you are not happy, but on others you may have to go back to the beginning each time. A cue sheet and stopwatch can be useful in speeding up the process.

The facilities available on different

machines vary widely. Some can flicker or switch between two slides without changing them, and others can flash, whereby one remains steady and the other flashes on and off. Some allow you to change the slide in one projector repeatedly while showing the same slide continuously in the other, whereas others do not. And some of the more expensive models can control more than two projectors. Once again, compatibility is worth checking: not all control units provide control information suitable for all projectors.

Playback is simply the reverse of recording. With the magazines in the projectors set to zero and the tape

Wide-screen projection is possible by fitting a special panoramic lens over the projector lens, but the slide shots must also have been taken with a similar lens

rewound, all you have to do is switch on the power to the various units and start the tape recorder running. The encoded information on the tape is converted into control signals by the control unit, and the presentation is played back as you recorded it.

A professional A-V set-up includes twin projectors and dissolve unit, speakers for the sound track, and a variable screen for normal and wide-screen projection



Heat treatment

If you take your camera with you to hot sunny places, your equipment and film may suffer the mechanical equivalent of heatstroke. But you can avoid this with a little planning and preparation

Hot weather, brilliant sunshine and an exotic location may sound like the ingredients for a photographer's paradise. But very hot weather causes a great many problems as well, particularly with equipment and film. Unless you take great care, you may find many of your pictures ruined by equipment failure or film damage caused by sand, dust, moisture, dryness or just pure heat.

The problems vary according to the climate. On top of the basic problems caused by heat and light, each type of climate causes its own additional complications. The dampness of an equatorial rain forest creates a different set of difficulties from the dry heat of the Arizona desert.

Equipment selection

Although your equipment seems to work normally even in moderately hot weather, in very hot weather you may find that even simple things, like the

Dusty dunes *This sort of landscape may look very attractive, but the dry, hot, dust-laden atmosphere can create havoc with your film and equipment*

black finish on the camera, cause trouble. Indeed, all black surfaces—on cameras, lenses and camera cases—heat up very quickly in bright sunshine. This is made worse when the temperature of the surrounding air is already very high. As a result, anything inside also heats up, and with cameras and lenses this causes mechanical problems.

At the very least, the movements of focusing, aperture and shutter speed rings tend to become rougher as various parts of the mechanisms expand differently. With some lenses this is more than compensated for on focusing and zoom rings by the thinning of the lubricants. In fact, the oil may become so thin that the movement is slack. It is not unknown for the zoom setting on a one-touch zoom to

move when the lens is pointed steeply upwards or downwards. If you are planning on a long stay in a very hot place it may be worth consulting a good repairer or manufacturer's service department about the possibility of having the normal lubricants replaced by heavier ones.

Shutters are also prone to faults. Even if the heat does not affect them, it is worth remembering that shutters are particularly prone to inaccuracies at the high shutter speeds you may be using in bright sunshine. Even in expensive cameras a setting of 1/1000 second can actually be as slow as 1/650 second. This could give 2/3 stop overexposure.

It is worth having your shutters checked by a repairer before you go so that if the speeds are wrong you can allow for this when exposing. It is also a good idea to bracket exposures. Fully electronic shutters are usually much more accurate than mechanical ones, as

Morning light You can avoid many of the problems of hot climates by shooting early in the morning when it is still quite cool and the lighting is not too harsh

are cameras employing off-the-film metering, such as the OM-2.

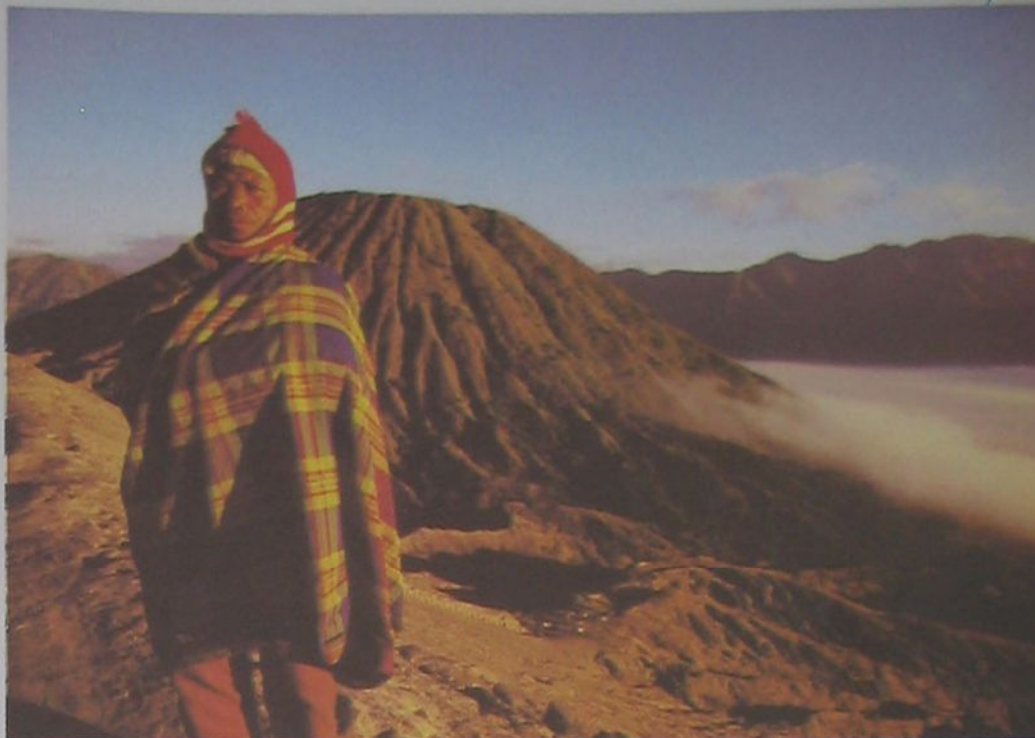
When possible, you should take the best quality equipment you can afford. You are then less likely to encounter problems such as melting of the lens balsam (which is used to cement elements together) resulting in loose elements. Another problem which is less likely to occur with quality lenses is that of grease distilling off the diaphragm mechanism, on to the elements.

A similar principle applies to filters. With cheap filters the colour coating can deteriorate in the heat, giving lower optical quality. Because of the very bright, glaring light which you are likely to find, it is wise to use multi-coated filters which help to reduce flare. And you should always use lens hoods, for the same reason.

Take as little equipment as possible. An outfit which seems reasonably light in the comfort of your hotel or sitting room can become unbearably heavy when you have to carry it in blazing heat.

The camera case can also be important. When you are actually shooting, a soft bag is best because it is most comfortable. But for travelling, a metal case is better, as it offers most protection. The case should be silver or white to cut down heat absorption (black or dark cases can be spray-painted a light colour), and gasketed cases, such as the Halliburton keep out moisture and dust better than other types. In moist conditions, however, avoid using foam filled cases, as the foam stores moisture and encourages corrosion.

Taped zoom One-touch zoom controls become very loose in hot weather, so if the lens is placed at an angle the zoom control may need to be taped in the right position to stop it moving



Taking care of equipment

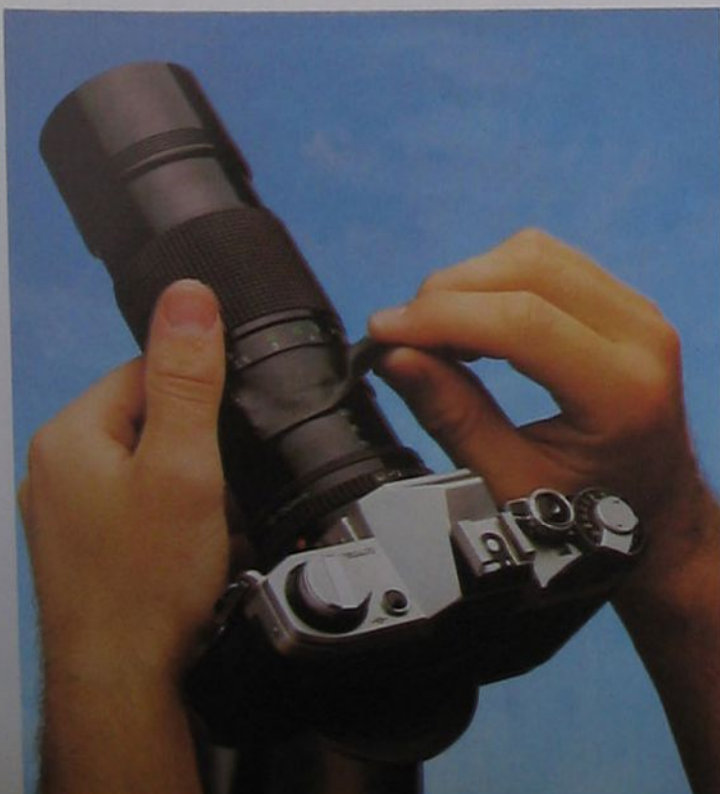
Never leave equipment lying in direct sunlight, even if it is in a camera bag. If you have to leave the gear in a car for a while—though this should be avoided if possible—do not put it in the glove compartment or on the parcel shelf. The safest places are under a light coloured blanket either on the floor or on a shaded seat. Try to park the car in some shady spot, but remember that the sun moves quite quickly, and your shady spot can soon become an exposed furnace.

Be careful when picking up cameras and lenses. They may be quite hot and, if not exactly too hot to hold, the shock

might cause you to drop them. In many places where it is very hot during the day, the temperature drops quite low at night. So if you have a safe veranda or similar outside place, leave the equipment to 'cold soak' overnight.

In dry places, dust is a constant hazard. It manages to get into the most inaccessible places, and can clog up shutter and lens mechanisms. You should clean your equipment every night using a top quality blower brush. 'Dust-off' sprays are not very useful—airlines do not permit aerosols to be carried on planes, and in very high temperatures the pressurized cans can

Cool box Picnic boxes are good for keeping film cool, though the rolls should be kept in plastic bags to exclude moisture. To get more film in, take the rolls out of their boxes first



Dave King/lens courtesy of Canon





Hard hoop Hard shadows can be difficult to avoid. One way round this is to use a simple composition which makes use of the deep tones and does not rely on detail

as rain forests and tropical swamps). Hot salt water is incredibly corrosive, so if you are working on a tropical beach with your tripod in the water, rinse the legs with fresh water afterwards.

Equipment should be kept as dry as possible in these conditions. Use silica gel in camera cases and bags. And try using a little silicone polish on metal and other surfaces (but not on the lens elements!). This helps to keep corrosion at bay. Should a few spots of corrosion appear, treat them with a metal polish such as Solvol Autosol.

Try to avoid using aluminium equipment, since this responds very badly to hot and wet conditions. And always have a cloth to hand to wipe down equipment which has got very moist. This simple precaution may stop the camera slipping from your hands.

Taking care of film

Heat, damp and excessive dryness create problems with film too. It is particularly important to keep film reasonably cool, as heat fogs film to give overexposure, low contrast and a marked colour cast (often blue). The effect is more noticeable with fast and professional films.

It is best, therefore, to use slower amateur films (with Ektachrome this means using ER as opposed to EPR, for

actually explode.

Dust can also cause equipment to bind. You may suddenly find that the filter on the front of your lens is impossible to remove. But with a little thought beforehand this can be avoided. Use a toothpick to apply a drop of oil to the filter thread. Similar precautions can be used with other equipment such as tripod legs and cable releases.

Dust can also get into cameras, so make sure that all possible problem areas, such as motordrive sockets, are well sealed, using gaffer or insulating tape if necessary. In extremely dusty conditions, some professionals even use

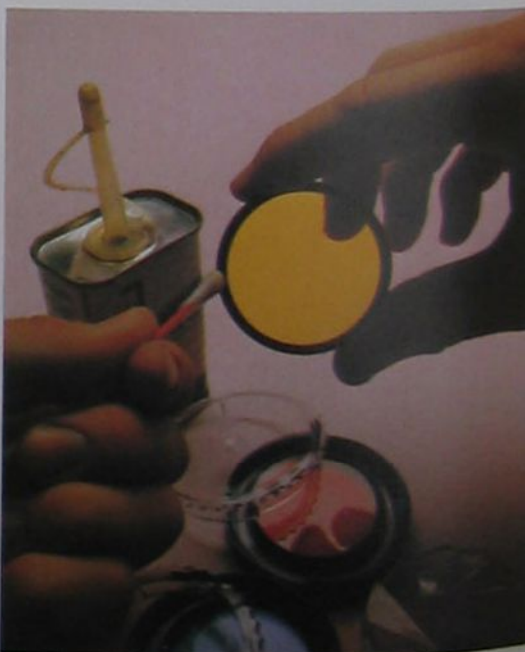
underwater housings or cameras.

Always try to protect your equipment from dust as much as possible. If the camera is left, unused, on a tripod, cover it with a plastic bag. Change films as fast as possible, and lenses as little as possible, making sure that you always fit lens and body caps. Also, try to keep the camera bag closed or covered. And use a case which can be opened and closed quickly.

If the climate is damp rather than dry, you are unlikely to have problems with dust. But you will have other problems. The main one is corrosion, especially in places with 100 per cent humidity (such

Taped back If there is a lot of dust, put tape over all the places where the dust could get in. But first, remove any dust or grit which is already on the camera using a large blower brush

Oiled thread Dust can easily get into filter threads jamming the filter on to the lens. To avoid this problem, lightly oil the filter threads before use with the help of a toothpick or cotton bud



Dave King

Distant haze Heat haze can be a problem, especially around midday when the sun is hottest, and can be obtrusive especially if you use long lenses

example) which keep better. Alternatively, use Kodachrome which does not have integral colour couplers. This means there is no problem with migrating colour couplers which would otherwise give a colour cast. In bright sunshine a 64 ASA (ISO) film gives you all the speed you need.

Film should always be fresh. When you go out each day, take only the film you think you are likely to need (plus a little extra for emergencies), keeping the rest in a fridge. Most hotels will let you keep film in the kitchen fridge if you ask nicely. If you are travelling around by car, use a picnic-type insulated box to keep film and drinks cool.

Exposed film is much more vulnerable than unexposed rolls, so have the film processed as soon as possible after exposure. E6 and C41 processing is available in most places round the world. Kodachrome can be sent home using the airmail parcel service.

In very moist conditions, keep the film in its original packaging as long as possible. After exposing 35 mm films, return them to the canister with a few grains of silica gel to keep them dry. With 120 films, put them in a tin or sealable plastic bag, again with silica gel. But never seal up film which has already become damp.

When film emulsion becomes damp, it is easily damaged. Any dirt or grit in the camera soon causes scratches, so you must be extra careful about keeping the camera clean. In very dry weather the static is a problem and can leave 'lightning' marks all over your film. To cut down the risk of this happening, always wind and rewind the film slowly. Using a motor wind almost guarantees some degree of static, so avoid them.

Care needs to be taken too when loading and unloading films, because of the

bright light. Always carry out these operations in shade, even if it is only the shade of your body. Otherwise fogging may occur on the first few frames of 35 mm films, and at the edges of rollfilm pictures.

Shooting the pictures

Shade can be very valuable when taking pictures. If the camera is on a tripod, use an umbrella over it. This not only keeps the equipment and film cooler, but also cuts down the amount of light which can enter the camera through the eyepiece. On some cameras this light can affect exposure readings with built-in meters.

The main photographic problem you are likely to encounter is extreme contrast. With black and white films this can be reduced by suitable processing, but with colour work you have to do something about it when shooting.

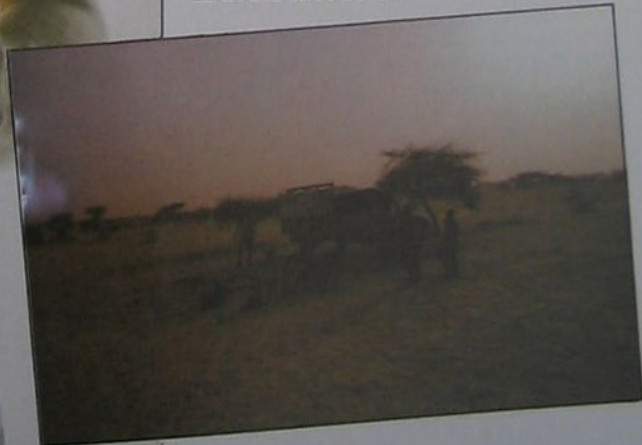
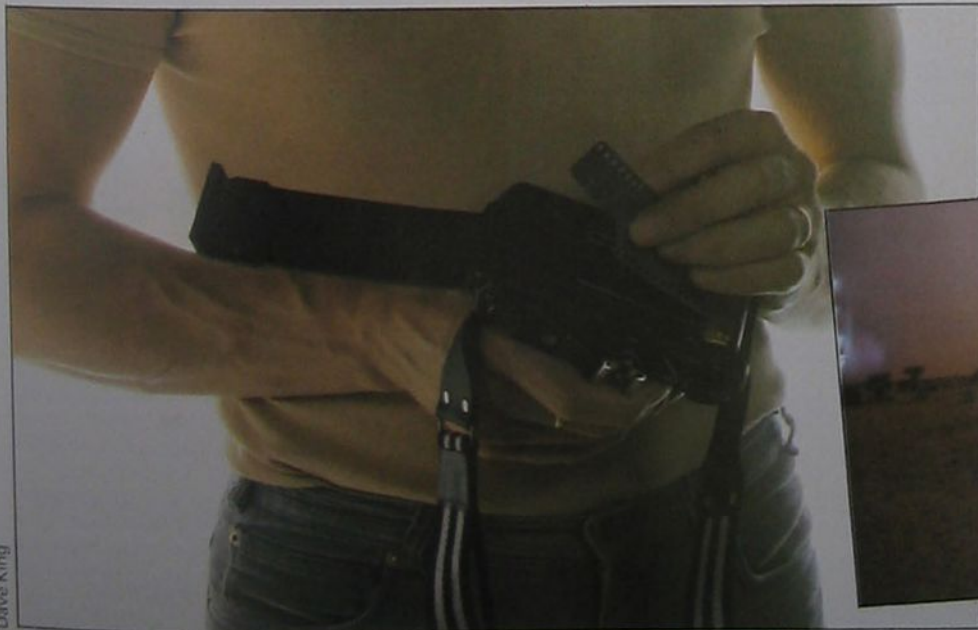
One of the best ideas is to use fill-in flash. This should ideally be slightly filtered, using an 81A or 10Y filter on the

unit itself, to stop the shadows lit by the flash becoming too blue and stark. Using flash in bright light can be difficult with some cameras because of the lack of a high enough synchronization speed. This is where cameras like the Nikon FM2 (which has a sync speed of 1/200 second) have an advantage.

Alternatively, use some sort of reflector—the most convenient ones being those made of foil. These fold up very small and usually have one silver side and one gold side (the latter being useful for warming shadows).

In general, the best times of day to shoot are early morning and late afternoon, when the colour is better and the sun is lower giving your subjects more shape. The early morning air is also reasonably cool and so does not suffer from heat haze, which can be a problem with long lenses when the land has warmed up. Midday sun in the tropics is extremely fierce, and you and your cameras are better off indoors.

Bright light You should always load cameras in the shade, even if it is only the shade of your own body (left). Otherwise light may get into the cassette through the velvet light trap and fog the first few frames, as in the shot below





World of photography

John de Visser

Although his work takes him all over the world, photographer John de Visser always prefers to return to his favourite subject—Canadian life and landscape

From the rugged grandeur of the Rockies to the sheer vastness of the prairies, Canada has some of the most spectacular natural scenery in the world. It seems to be a landscape photographer's paradise. But few have captured both the beauty and the atmosphere so clearly as John de Visser.

Yet there is more to de Visser's work than superb Canadian landscapes. In over 25 years as a professional photographer he has successfully covered assignments on everything from coal mines to social documentary. Although the Canadian landscape is immensely photogenic, he feels there is more to his success than this.

'As far as I'm concerned there's a picture to be had anywhere. It's a terrible cliché, but it's true. You don't need to go further than your own backyard to find a whole range of subjects. One of the few things you have to learn as a professional photographer is how to make a picture of anything.'



John de Visser *Although he was born and brought up in Holland, de Visser now regards Canada as his real home*

Nevertheless, de Visser is clearly at home in the vastness of the Canadian landscape and although he travels far and wide over the world, he is always keen to return to the country he loves.

As he says, 'I think it is probably the single greatest country in the world—both in its variety of scenery and its natural resources and riches. Because there are so few people you've got plenty of space to live in. Perhaps I particularly like it because I was brought up in Holland which is the most densely populated country in the world and I found it very claustrophobic.'

It is this feeling of vast open space that seems to run through de Visser's landscape shots. Even when de Visser introduces people into his photographs they are likely to be tiny figures dwarfed by the sheer scale of the landscape.

Although de Visser is now famous for his photography, when he first went to Canada he earned his living at practically everything but photography.

Jackum Brown



Yukagir family, Siberia Part of a small tribe of nomadic reindeer herders living on the shores of the Arctic in Siberia

The bride (left) Traditional painting on the hands of an Indian bride, taken on assignment for the Indian Tourist Agency

However, at the age of 24, two years after he arrived there, he visited the Niagara Falls with a Box Brownie. He was delighted when the man at the local camera shop told him that the pictures he brought back were some of the best he had ever seen. Thus encouraged, his enthusiasm for photography grew and has remained strong ever since.

Right from the beginning he concentrated on colour photography, spending every extra dollar on his new hobby. Then in 1957, at a time when his photography was already filling every spare moment, he took some pictures he had shot in and around Toronto into the offices of *Maclean's*—Canada's biggest

selling magazine. The result was dramatic. The magazine published his pictures over 16 pages and the essay—*A New Look at Toronto*—won several major awards.

De Visser's name was made and more work soon began to come his way. At first he would carry out his assignments in the evenings and at weekends. But, in 1960, he decided to resign from his job and take up photography full time. As he says now, he was taking a gamble but the risk was made easier because of the support his first wife gave him—both financially and emotionally.

However, he was soon in demand and feels that it was one of the best times to get started in the business. 'I was lucky to start at that point—the whole editorial field was still large. There were enough magazines like *Life* around which needed an enormous amount of photography every week, so the market for the relatively few photographers around then was very good.'

At the beginning of his career, de Visser worked as permanent freelance photographer on the colour magazine of the *Toronto Star* newspaper. This gave him considerable experience of a wide variety of assignments all over Canada. At the same time he did freelance work for other magazines and book publishers—partly because he took the trouble to take his portfolio around.

Even though this task was very hard work and often extremely discouraging, de Visser feels that it was an important element in his success. He believes young photographers should never be put off by a series of refusals. 'You must keep going, even if you get turned down a lot. They'll often give you a job in the end—even if it's just to get rid of you—and then you can prove your ability. Even when you're successful,' he adds,

Glimpses of royalty Small children squeeze under the seats reserved for senior citizens on the Royal Tour of Canada in 1973



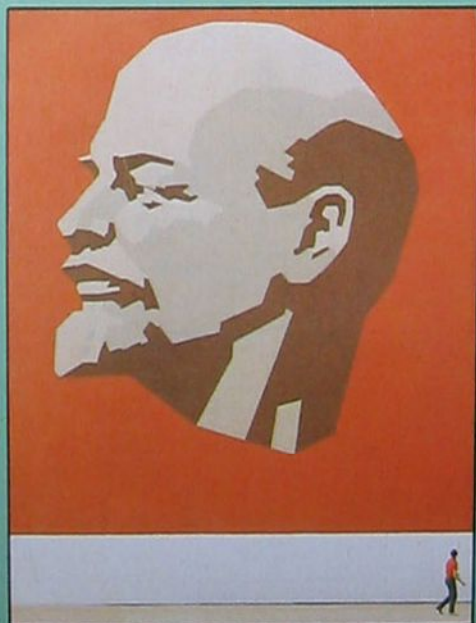


Recycling Crushed beer cartons make a colourful sight at a Winnipeg paper mill. Taken to illustrate a company report

Moscow, 1971 A lone Russian dwarfed by a giant mural of the Soviet Union's founding father, Lenin, at the National Exhibition

'you still have to keep trying.'

One of de Visser's big breaks came in 1964, when he was commissioned by the National Film Board of Canada to take photographs for a book to celebrate Canada's centennial year of 1967. He had already done a number of commissions for Canadian government tourist bureaux, but this project was different. He was to be fully credited and the book proved to be a major showplace for his work. The director of the project, Lorraine Moffatt, selected landscapes from some of Canada's leading photographers. And then she commissioned



several of them to cover those parts of the country which were not already featured in the selection. The project lasted on and off for the next three years and cost a total of \$1,000,000 but, in the end, it was the only centennial project to make money. The book, eventually called *Canada: the Year of the Lion*, is still on sale over 15 years later.

But for de Visser the project was not just a marvellous showplace for his work but a refreshingly unrestricted exercise in photography. The photographers were given fairly loose instructions about where and what they were to photograph and given complete freedom to interpret this in the way they wanted.

De Visser's work for this book had two other important results. It gave him experience in publishing and so provided the basis for him to produce a number of books of his own. And it confirmed in him a deep love of Canada.



Bombay market *An attractive array of shiny water melons caught in the sunlight on a street vendor's stand in southern India*



West Indian schoolgirl *Shot while on assignment in St Vincent for a Coca Cola advertising campaign in 1970*

Besides contributing pictures to a large number of books, de Visser has published 11 books illustrated entirely with his own photographs. Most of these are associated with some aspect of Canadian landscape, life and culture.

One of the first was done in collaboration with the Canadian writer Farley Mowatt whom he had already met through the *Canada: the Year of the Lion* project. It was a book on Newfoundland outposts, and—unusually for de Visser—it was shot entirely in black and white.

Most of these outposts have been small fishing hamlets for centuries and were



Lake Nipissing Taken for a video using film and stills to celebrate the Ontario Northland Railway's Centenary in 1982

probably first settled by the French and Portuguese. In the far reaches of Newfoundland they can generally only be reached by boat but now even these outposts are gradually changing. The book was an attempt to record a still unique, but disappearing, way of life.

Other books that de Visser has worked on include *Early Canadian furniture*, *Treasures of Canada* (a guide to the country's heritage) and *Rivers of Canada*—written by the well-known Canadian author Hugh McLellan. All of them gradually brought de Visser more and more into the public eye and he became firmly established particularly as a photographer of the Canadian landscape. Eventually, in 1976, this led to his making a major contribution to another National Film Board book project. This was to be called *Between Friends—Entre Amis* and was Canada's official gift to the people of the United States on the occasion of their bicentennial.

The idea was to look at the 100 mile stretch either side of the border between Canada and the USA. 'I made one major trip for it starting in Northern Ontario and worked my way all the way over to British Columbia photographing as I went. It was a marvellous assignment as I could do whatever I wanted.

'There was one little crossing-point in Saskatchewan which I got to at about four in the afternoon. I asked the border guard how he could stand it as the border seemed so lonely. "Oh I'm O.K." he replied, "Today was a busy day, you're the fourth car." Round there, there are just miles and miles of nothing. I remember once driving for an hour without seeing a single car, just fields.'

Working on such varied assignments, de Visser has to be particularly careful to choose a reliable camera with good service facilities and, at present, he uses a Leicaflex for all his general work. He also has a Hasselblad and a $2\frac{1}{4} \times 3\frac{1}{4}$ inch Pentax. 'When I go on a shoot I take two camera bodies and a selection of lenses—it's too cumbersome to take my complete range. I may use them all at one time or another but I prefer to take the 21 mm lens if I want to capture a sense of space, or when I'm photographing architecture. Another of my favourites is the 135 mm lens.'

De Visser does not use many extras although he carries a tripod and occasionally uses a warming filter, especially in the Arctic. Like most professionals, he shoots a lot of film but tends to bracket his exposures only when the situation is dubious. 'I should perhaps bracket more. Even half a stop can make the difference between a good, and a much better, picture.'

Travelling in the far north of Canada also provides de Visser with a variety of

technical challenges. On one bizarre occasion, for example, the extreme cold froze his camera to his face and he had to retreat indoors to warm it off. The bitter cold is not just a physical handicap, but can seriously affect the functioning of his film and equipment. He has his cameras winterized, when travelling in the Arctic, by replacing the oil by graphite. And he takes care to keep both cameras and film as warm as possible.

He once had to photograph an Inuit building an igloo on Baffin Island when the temperature was 40° below zero. The 50 km/h wind meant that the effective temperature was over 70° below zero, so that when he tried to rewind his film he found that it rapidly disintegrated.

However, his experiences in the Arctic proved helpful on two extensive trips he made around Russia. The first of these was with Farley Mowatt when they toured the far reaches of Siberia—going to some places that had never before been visited by Western journalists. The second was a trip accompanying Canada's premier Pierre Trudeau. As de Visser says, 'One of the great benefits of this profession is that you have such great opportunities. On that trip we visited Samarkand, one of the oldest cities of mankind. I had just read Marlowe's *Tamberlaine* and to find myself in Tamberlaine's tomb was an amazing experience.'

Nowadays, most of de Visser's work

comes from commercial or industrial sources, but even these assignments can take him to some outlandish locations. An assignment for Mobil Oil took him to Sable Island, a gigantic sandbar 200 miles out in the Atlantic off Nova Scotia, where Mobil had asked de Visser to take some publicity photographs to show the Canadian public their concern for the environment.

Sable Island is a very fragile environment on shifting sand. It is populated only by wild horses and four families—employed by Mobil to man the radio and weather stations and care for the environment. Mobil gave de Visser a very specific brief on this assignment. But even in these circumstances he always feels there is room to try for a better or more unusual shot, and here he was keen to get a picture of one of the environmentalists with the wild horses.

'We approached a small group of horses that were used to roaming near the environmentalist's home. While he went very slowly towards them, I hung back. Then suddenly a small colt went up to him to have its nose scratched and I got some amazing pictures.'

Other commercial assignments have stretched de Visser's skills even further. On assignment for Shell, he had to do shots for brochures on a new open-cast coal mine. Like Mobil, Shell were keen

Dawn landscape De Visser took this image as part of a series of photographs for a book about south western Ontario



John de Visser

to display their concern for environmental issues and they were again employing an environmentalist. However, the processing plant was still under construction and producing attractive shots for brochures which would impress both visitors, buyers and potential investors was no easy task.

For de Visser, however, such jobs are an enjoyable challenge and one of the rewards of his profession. He is also very aware that as you get older it is easy to get into a rut. 'If you know that a previous approach to a problem works, it is sometimes easy to fall back on the old ways. But this is a dangerous thing to do.

Shadows An unusual picture of the Cenotaph taken for a book on Ottawa for the National Film Board of Canada

People do not want to see the same thing again. It's impossible to do something new all the time, but you have to try.'

In the end de Visser feels his most vital asset is the fact that he still really enjoys photography. 'It helps a lot if photography is not just a means of making money but also your hobby—the thing you really want to do. It's true to say that when I get bored I go out and take some pictures, because I really like taking them—just to please myself.'



Video cameras

As more and more amateurs turn to video in place of home movies, electronic cameras are becoming increasingly common. So how do video cameras produce their images, and what are their limitations?

A short time ago, the bulky cameras of the television studio, manoeuvred on their own vehicles, seemed little to do with home movie making. But over the last ten years, the video revolution has been gathering momentum and now video cameras no bigger than their Super 8 film rivals have become widely available for amateur use. Indeed, the video camera, with its instant playback facility and its ability to shoot for hours on end, may soon take over from movie film cameras altogether.

The idea of the video camera dates back to 1908, when the British scientist Alan Campbell Swinton suggested the possibility of an all electronic rather than film-based moving picture system. But more than 20 years elapsed before television technology had developed sufficiently far, with the invention of the *Iconoscope*, for the theory to be put into practice. The *Iconoscope*, invented by Vladimir Zworykin, a Russian emigrant working in the United States, has proved to be the basis of nearly all modern video cameras. Indeed, the EMI-developed camera used by the British Broadcasting Corporation for the first regular TV broadcasts in 1936 was very similar to the original *Iconoscope*. Since then, many refinements have been made but, with a few exceptions, the basic principles remain the same.

Pick-up tube

In some ways, the video camera is similar to a film camera. It is essentially a light-tight box with a surface for recording the image in the back. At the front, there is a lens for focusing the image. The real difference lies in the way the image is recorded. Rather than varying densities of silver and dyes on film, the image is recorded by a *pick-up tube* as an electrical signal.

In amateur videos, the

pick-up tube is of the *vidicon* type, first introduced by RCA for industrial use in 1952. Other names have appeared since then such as the *Saticon* and the *Trinicon*, but these tubes are merely variations of the original *vidicon*.

The *vidicon* consists of a glass cylinder with a light sensitive target at the front and a gun for firing a beam of electrons at the back. It works rather like a TV tube (see page 1841) but in reverse. Like certain light meters, the electrical conductivity of the sensitive front surface varies according to the intensity of light falling upon it. So a pattern of electrical conductivity is produced at the front surface that corresponds to the brightness of every part of the scene. The electron beam from the gun at the back of the tube scans line by line across this pattern rapidly to release a series of electrical charges that flow out as a *video signal*. The voltage of this signal varies according to the brightness (*luminance*) of the original scene.

Most video cameras nowadays, however, are colour; and for colour, the light must be separated into its red, green and blue components.

The better cameras have three pick-up tubes, each filtered to receive the appropriate colour. In the majority of amateur cameras, however, only one tube is used and colour separation is achieved with a single filter of very fine coloured stripes.

A video signal must carry more than luminance and colour (*chrominance*) information because the picture must be reassembled on the screen in the way they were recorded. To achieve this, synchronizing pulses are added to the signal—these are the equivalent of the perforations in movie film. The resulting signal is known as *composite video*.

The strength of the video signal is controlled in two ways. First, the amount of light actually reaching the pick-up tube is controlled with an iris diaphragm. On most cameras this is automatic, though it can be operated manually. It works by comparing the voltage of the video signal (which is a measure of light coming through the lens) with a reference voltage and then making appropriate adjustments. If the compensation is more than this iris can give, an automatic gain control (AGC) comes into operation

to restrict the voltage of the signal. There may also be a switch to provide an extra voltage boost for low light work, but this can make the picture rather 'noisy'—similar to a grainy film image.

The range of light that a camera can work in is quoted in lux, and is normally between 100 and 100,000 lux. This means that it can cope with a range from a reasonably well lit room to a bright sunny day. Sensitivity is increasing, however, and there are now amateur cameras that will work at 50 lux or less and give acceptable pictures in brightly lit streets at night.

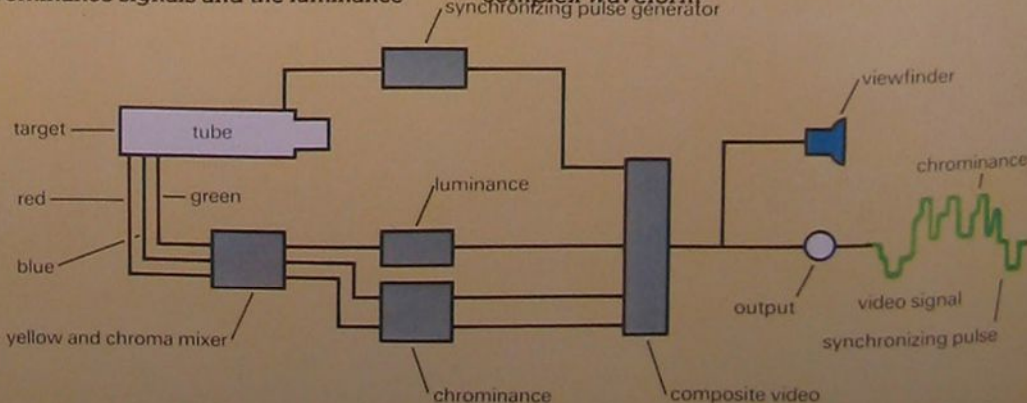
The viewfinder

All modern amateur cameras have an *electronic viewfinder*—a small monochrome television screen with a magnifier. This can be used for framing, focusing, and checking picture quality.

Unfortunately, this screen cannot be used for colour checks because conventional colour television needs a *shadowmask*. This is a mask with many perforations which is set immediately behind the screen. Perforations are in sets of three, each angled to accept the electron beam only from one of the three

Single tube video

The camera has red, green and blue output signals. These are processed into two chrominance signals and the luminance signal. With the sync pulse added, the result is the video output, which has a very complex waveform.

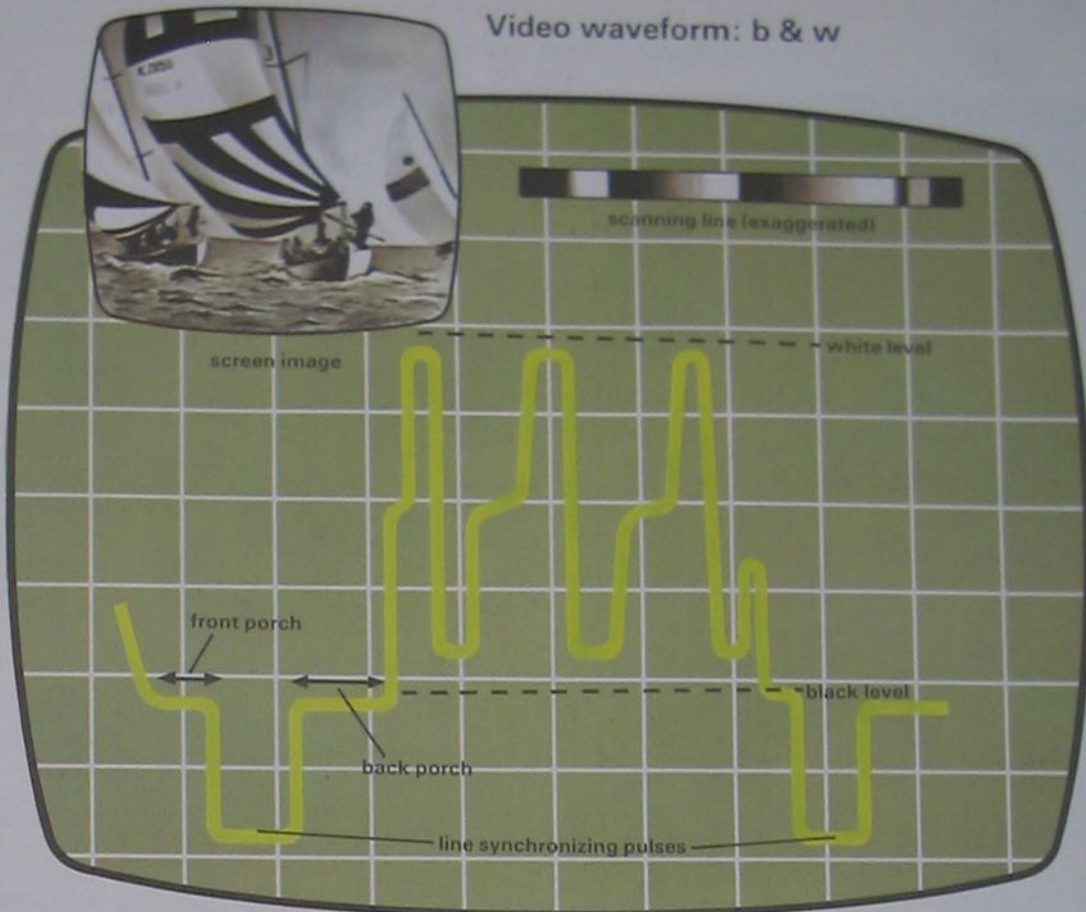


Waveform Each line of a black and white image consists of an electrical signal varying in strength between a black level and a white level. At the beginning of each line there is a sync pulse which is separated from the scan lines by a 'front and back porch'. These give the scan signals time to die away and rise again

guns needed for a colour image. While this pattern is not noticeable on large screens, it would be very obvious on the small screen needed for a viewfinder. Adjustments to the colour balance for various lighting conditions are made in one of two ways. Gross adjustments are usually made with built-in filters. Fine adjustments are made with a special tint control.

Video film

There are clearly some fundamental differences between video and film cameras. The most obvious is the way the video image is built up. To build up the screen image the electron gun scans across the screen in a series of lines—usually 625 or 525—like following lines in a book with a pen. But instead of scanning every single line, it scans every other line on one passage and then fills in the gaps on a return passage. The idea of this doubling up is to give a faster framing rate, at 50 per second, without having to provide any more picture information. This means that the video image is very flicker free compared with movie film.



However, the limited number of lines means that resolution is very poor compared with film. Recently, though, some manufacturers, particularly in Japan and the United States, have been experimenting with various 1125 line, *high definition* systems which are claimed to give resolution as good as 35 mm film. However, these have their own problems and may prove suitable for specialist use only.

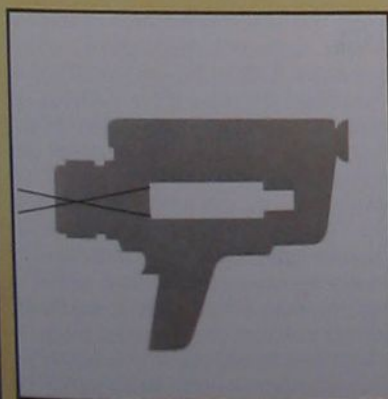
Video also has a more

limited contrast range, so that highlight and shadow areas contain less detail than they would on film. Small highlights also tend to leave trails behind them if the camera is moved. In low light, on the other hand, a person moving across the frame appears ghostly because the static background tends to 'stick' under those conditions.

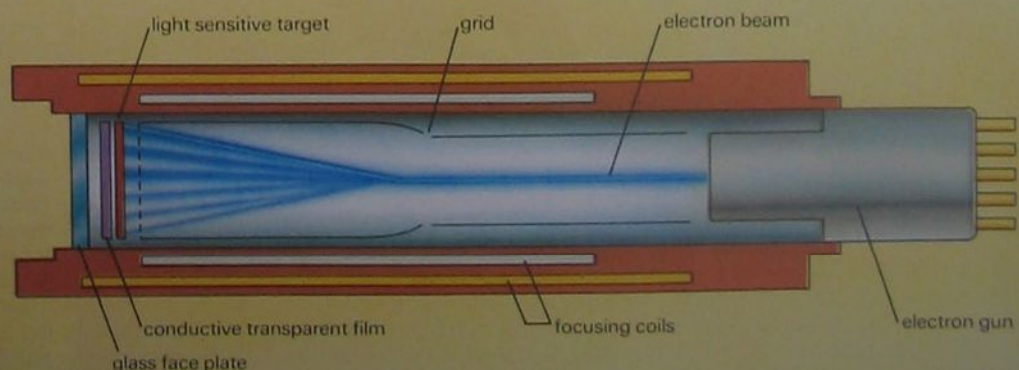
Modified vidicons do improve on the performance, with moderate success. But the future lies with solid state

imaging in the shape of the *charge coupled device* (CCD). This is very much smaller since it is a tiny electronic chip. It is also less susceptible to physical shocks and burning by bright lights—video camera operators are always warned about aiming their cameras at bright lights. So when cameras are combined with micro video recorders by the middle of the 1980s, the CCD will almost certainly be an important component.

Vidicon tube



The image is formed as a conductive pattern in the photoconductive layer. This is scanned by an electron beam which is focused by the coils and accelerated by the charged grid plates. The electrons which the target accepts form the output current, which varies in strength with the image brightness



MAKING COLOUR SEPARATIONS

Colour separation—the splitting up of a coloured original into its blue, green and red components—is an essential part of many high quality colour printing and derivation techniques

All coloured photos depend on splitting the original multicoloured subject up into just three components. For most photographers this is done automatically by the three layers in colour film. But there are times when you may need to split a colour image into its separate colour components in the darkroom.

This is necessary when printing a full colour image by silk screen or dye transfer, for example. Alternatively, you may wish to experiment with three-colour posterizations or with finely controlled additive colour printing. And the same basic technique is used in the printing industry to make the half tone negatives for colour reproduction in magazines and books. In all cases the three different versions of the same image are called *colour separations*, and are monochrome images made using carefully selected colour filters which divide up the spectrum between them.

Choosing the filters

The three filters are known as a *separation set* and are always blue, green and red. A variety of separation sets are available for different purposes, and it is important not to mix filters from different sets. For example, if the original is a colour transparency, its three colour layers overlap slightly in transmission as can be seen from the spectral transmittance (see page 1971). To prevent, say, the green separation filter from recording a little of the cyan image you should use a *narrow cut* filter set when making separations. These filters transmit light in narrow bands of the spectrum, right in the middle of the wide bands of colour absorption of the transparency. Other filters may not have such narrow transmission bands, and separations made using filters chosen from different sets could give odd, unusual results.

In practice, one set of filters will do for

Three colour split If you want a really high quality reproduction of, say, a fine painting, you may be tempted to make a dye transfer print or, for less cost, a top quality additive colour print. For either of these methods you will need a set of colour separations exposed through blue, green or red filters and subsequently printed through these to make the final coloured print



most purposes, though the results may not be perfect in every case. Most photo-dealers either stock or can order three-colour separation sets, such as the Wratten series 29, 61 and 47B, which are narrow cut filters. Additionally, the dichroic filters used in enlargers designed for additive printing may be suitable for exposing the separations.

When making separations through filters, the exposure must be increased compared with that using no filter. This is usually expressed as a numerical filter factor by which you multiply the original exposure. Ideally the filter factor ought to be measured for each filter you use by making a series of exposures using standard grey scales and measuring the resulting image densities on a densitometer. But most home darkroom users do not normally have access to such equipment, and in practice you can get fairly good results by using the factors supplied with the filters or published by the manufacturer.

Making the separations

You can make a separation negative from any kind of original—transparency, artwork, flat copy or even the original scene. The easiest procedure is to work from a transparency. But the first time you make separations, you will have to establish your exposure times and filter factors, and it is therefore very useful if your original contains a standard grey scale. It is a good idea to take a set of shots for this very purpose, using perhaps a small tabletop set-up including a standard grey scale, available from photo dealers. This contains densities running from pure white to dense black, so it enables you to see how the contrast is varying as well as the exposure. If you prefer, you could tape a *transmission scale* to the edge of the original slide. This is on a film base rather than paper, but is used in the same way.

Ideally, you should measure the grey scales on your final separations using a densitometer. But it is possible to check the results by a visual comparison, and you should be able to see quite easily if there are any variations in exposure or contrast that should be put right.

Separation negatives must be made on panchromatic film. The scale on which you make them depends on the use to which they will be put. For copy purposes, the 35 mm format may be adequate if you do not have a bigger enlarger, but if possible you should work with a larger format. Special separation film, such as Kodak Separation Negative Film 4133, Type 2, is available, but satisfactory results may be obtained with ordinary pan film.

When making a set of separation negatives from a colour transparency, not only should you give a separate exposure through each filter but you should develop each negative separately to allow you to control the contrast. For this reason, even if you are working at 35 mm size, it is preferable to make the negatives on sheet film for

Separations from a colour transparency



1 To make large, high quality colour separations for contact printing, the following items will be useful: transmission and reflection types of grey scale (Kodak); punch register; separation filters; sheet film with matched developer; dishes for large sheet processing, or a deep tank if you prefer. Use an enlarger of as large a format as possible



2 You can work from a copy slide of the original and grey scale combined. Or tape a transmission grey scale carefully to the edge of your original slide



3 This shows the projected image. Line up the pin bar and fix this to the easel using double-sided tape. Position this in relation to the sheet film



4 The sheet film area should be large enough to accommodate the grey scale beyond the actual image area. Cut a piece of black paper to act as film backing



5 Expose the red colour separation first, using a Wratten 29 filter, in darkness. Use a test sequence to establish exposure. Put the film aside in a suitable dark store



6 Check the temperature of the developer, in darkness, before commencing the film processing sequence. Exactly the same procedure must be used for each film sheet



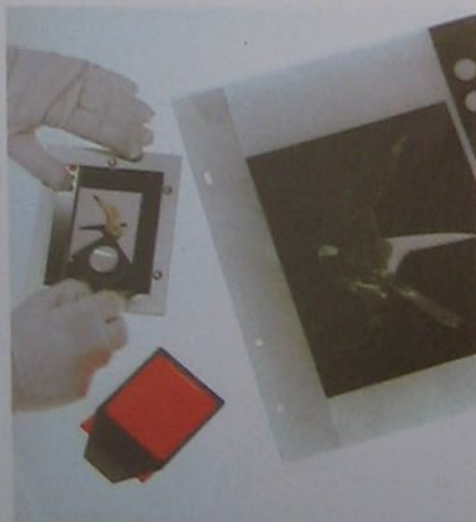
7 Carefully steer the film sheet first through the developer, then stop bath and fixer prior to inspection. If exposure is wrong, make another negative



8 In turn, expose the green (Wratten 61) and blue (Wratten 47B) separations. On each occasion, check the developer temperature before beginning development



9 Because processing in dishes involves working part of the time in darkness, you may prefer to use lidded deep tanks—but this restricts the size of contact negatives



10 For really accurate separations, not only should the three negatives match each other in density and contrast, but selected tones should correspond with the original



11 Large size separations are easy to contact print in register—the same pin set-up can be used. Here an additive test print is being made to red light

large size contact printing.

When making the separations, two changes from normal procedure are needed. First, place the transparency in the enlarger, emulsion side up, so that the image is reversed. This will mean that when you come to use the negatives they can be printed emulsion-to-emulsion with the paper or whatever medium you are using.

Second, place a sheet of thin black paper on the enlarging easel after focusing, so that no light will be reflected back through the film to give flare. Now you are ready to make the separation exposures through the colour filters.

As you do this, identify each piece of film by cutting different corners so that they can later be given their individual development times. All this work must be done in the dark, as the film is panchromatic. The standard code is to cut no corners on the red negative, cut one corner on the green negative and two on the blue negative.

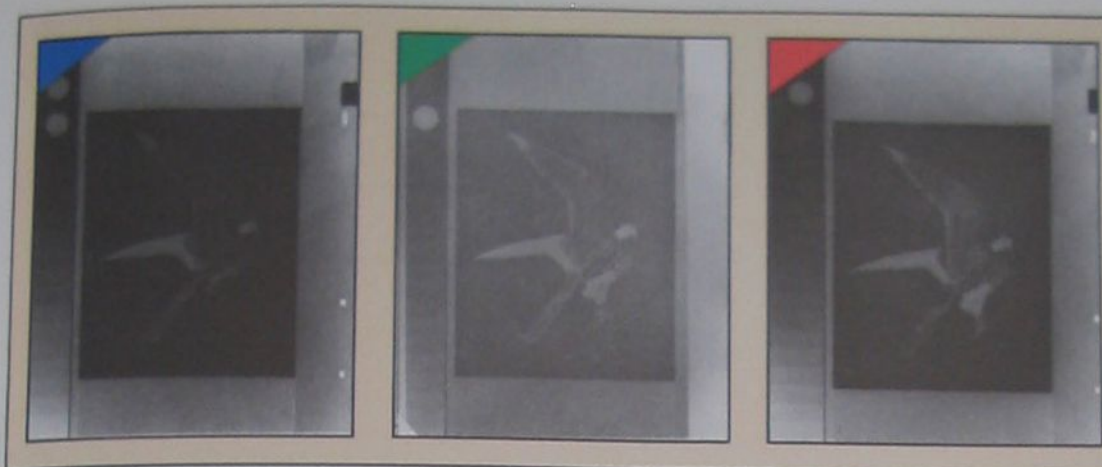
The exposures you give are very much a matter of trial and error. Each darkroom worker evolves a particular means of controlling the exposures from one separation to the next. Some prefer to keep the exposure time constant and vary the aperture, so as to avoid problems with reciprocity failure, while others keep the aperture constant and vary the exposure time, since enlarger lenses can be difficult to control precisely and in any case you can lose track of where you are. Whichever method you choose, always make the exposures in the same order—usually red, green, blue—to help make sure you give the correct exposures. The actual exposures will depend on the negative material, subject matter and enlarger system, but it is important to maintain the same ratio between the three exposures.

Kodak recommend that with their narrow cut separation set of Wratten 29, 61 and 47B filters you give exposure times of 25, 15 and 30 seconds respectively. This is for 'standard illumination' at an aperture of $f/8$, and specific emulsion, but you can use these figures as a starting point for your own tests.

Processing separation negatives

The three exposed negatives should be developed together at the same time in fresh developer, for consistent results. But you will probably need to adjust the development time for each separation in order to give a uniform contrast, so you must make sure that you can identify each one in the dark. One way to do this is to process them in a deep tank using wire hangers which you mark in some way along the top edge, such as by fastening twists of wire to each one, in the same sequence as your corner cutting. The developer you use may be your standard film developer, but it is common to use a fairly active developer, such as Kodak HC-110—though DK-50 or D76 could be used instead.

Again, there are Kodak recommended development times, which apply to their



separation negative material in HC-110 at dilution B. These are 4½ minutes each for the red and green negatives and 7 minutes for the blue. It is worth giving the same relative development times to your material, as a starting point, before assessing the results.

Assessment

The professional way to check that the exposures and development are correct is to measure the densities (see page 1518) of the patches on the grey scale which you photographed, plot them out on graph paper against their known density, then adjust exposure and development so that the three scales match as closely as possible.

In the absence of a densitometer, you can compare the scales on your negatives visually on a lightbox. It is useful when doing this to cut a hole in a piece of black paper just the size of one of the patches on the negative, so that you are not misled by the contrast with other patches. This may be rather tricky if your original is 35 mm size, however.

You can actually make reasonably accurate density estimates if you buy a Kodak Photographic Step Tablet, Type 2 or Type 3 (which is the larger). This has 21 steps which you view by transmitted light, varying from clear base (density 0.05) to dense film (3.05) in steps of 0.15. These are nominal figures only, but they are close enough for most purposes.

Kodak recommend that in a good separation negative, a dense part of the transparency, with a density of 3.0, should reproduce on the negative at a density of 0.35 to 0.4. You can check this by comparison using a step tablet.

Ideally, all three grey scales should be identical. If they do not match, first repeat the set with corrected exposures so as to get detail in the denser parts of the transparency. The second step of the grey scale should just be visible above the base density. Having done this, you can compare the scales for contrast. All three scales should get progressively darker at the same rate, and the last

discernible step at the dark end should be the same for each negative. If they are not, then repeat the exposures and alter the development for one or more of the separations.

You may find that with your system, you arrive at quite different exposures and developments from the starting point. And in order to get good results you need to give more exposure and less development to one separation.

Having done all this, you now have a standard exposure and development sequence for transparencies on a particular film with specific filters. You can also make separation negatives in the camera directly from a static subject, by making separate exposures—

Fault By comparing the step tones at the side of the separations, it is possible to isolate development and exposure faults—here, in the green separation negative

through the different filters—on ordinary b & w panchromatic film.

In this case, you must fix the camera as rigidly as possible and use a filter holder in front of the lens. Exposures are varied in the same way as for enlarger work, though your exposure times are briefer. Make all three exposures as quickly as possible to avoid changes in lighting. If you wish to give separate development to each negative, allow a frame space between each negative.



Final result Careful adjustment to the original and final exposures of colour separation negatives can be used to make minor colour and contrast alterations



Creative approach

Graphic images

Developing a good sense of graphic design can help you to create much stronger impact in your photographs—it also teaches you to be much more selective about what to include in the frame

Often the photographs that have the strongest impact appear to be the simplest, relying on strong composition and bold use of shape, form and colour. These images are usually described as being 'graphic' but their apparent simplicity can be very misleading—a great deal of thought and selection will have gone into producing this effect.

Strictly speaking, the word 'graphic' means vividly descriptive. But it is usually associated more specifically with designing and organizing an image or group of images to make it as attractive as possible. This is vital in book or magazine production but it is also a very important part of the picture-taking process. For a photograph to look good, like a magazine design, all the elements of the picture must work together to present the image clearly and effectively.

Graphic photographs call for a strong, bold design. Photographs taken without a clear aim in mind inevitably convey their aimlessness to the viewer. To be able to communicate clearly, it is essential to work out precisely what you want to achieve and cut out absolutely everything that does not contribute to the desired result. This does not mean that the images have to be banal and obvious—just simple and direct.

One way that this selectivity can be achieved in photography is with telephoto lenses. With a telephoto it is possible to isolate details in the city—the patterns of the cars stuck in a traffic jam, the reflections in the skyscraper windows, the neon lights or the shapes created by the ebb and flow of shoppers. While detail and information is lost, pictures may be far stronger and have far more impact. Indeed, the simplest

subjects often work best providing you can reduce the image to its bare essentials. Then, even things as mundane as road markings may make strong, graphic images.

Some subjects are ideal for graphic images and once you start to develop a strong sense of design, you will notice more and more potential in your everyday surroundings. Large neon signs, the lettering at fairgrounds and amusement arcades, intricately painted coaches or even a subject as simple as a white park bench standing out against a dark background, are all examples of the sort of subjects that are often used as raw material for graphic compositions. When confronted with such a subject, try looking through different lenses and also experiment with angling the camera itself so that a horizontal becomes a diagonal, this may help you define pure

Building Diagonal
lines give an image a dynamic quality, so it is often worth composing a shot to exploit this. Here the photographer chose a low viewpoint to create these shapes

Solitary figure
Simplicity is one of the keys to good graphic images. This is achieved by reducing the scene to the bare essentials

Foot Often, the apparent simplicity of a graphic image is misleading but in fact a great deal of thought and effort goes into an image that relies primarily on strong composition like this

Vautier/de Nanxe



shape within the subject itself.

Another vital element, closely linked to lens choice is cropping. It is important to be aware of the edge of the frame. Do not let little details creep into the frame to detract from the simplicity of the image. Graphic images often rely on extremely accurate framing so it is important to know exactly what the relationship is between what you see in your viewfinder and what you actually end up with on a transparency. For example, there is no point in composing a shot so that you place a strong line of colour across one edge of the frame—only to find that when the transparency is returned from the processor that the line has been obscured by the mount.

Graphic shots often break the basic rules of composition to make an image stand out. For example our world is built on horizontals and verticals, and we are used to seeing everything from a vertical point of view, and the vast majority of photographs are taken with care to ensure that the verticals visible in the shot are indeed vertical. This can be exploited by deliberately taking shots at an angle, so that they appear 'wrong' and will attract attention. Bold use of diagonals in a shot can give it a strong feeling of movement.

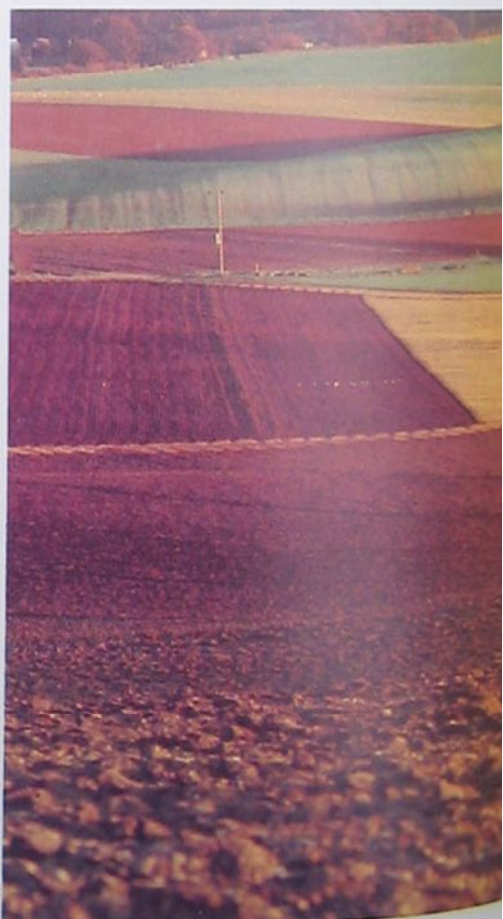
Careful balancing of the elements in a shot will give the opposite effect to dynamism and instill a mood of calm and serenity. This too is a method that can be used in graphic photographs but often, to create drama, the opposite approach is employed, and a deliberate imbalance is used to create disquiet and to invite reaction. For example, a small delicate object such as a leaf with its complicated form and shape will have these qualities emphasized all the more by being placed against, and surrounded by a background with completely different

Richard Haughton





Tree Bold use of shape and colour also enhance the graphic effect and for this the high contrast of Kodachrome is ideal. **Study in blue** Abstracts relying on simple colour and graphic shapes are particularly effective photographs





Creative approach

foreground of your image with whole trees visible in the distance—make sure you stop right down to render both compositional elements in focus.

Some subjects have a strongly graphic nature and do not need such devices. A section of steep winding road picked out with a telephoto lens so that it appears to rise from the ground almost vertically, or a close-up of the patterns of parched earth are example of such subjects.

Colour, or tone if working in black and white, also needs to be bold to give power to the image. The colour too can be balanced or discordant, whichever is appropriate to the 'feel' of the subject. Strong colour gets noticed, and certain combinations can give further apparent depth to a shot, for example red will be seen to almost leap out of a blue background—look for road signs against a rich blue sky. Look at the way other designers approach colour, on posters, on book covers, in advertisements, in fashion.

Black and white needs a slightly different approach, with an emphasis on tonal contrast to achieve impact. Look for the texture of objects when seen in 'hard' light—printing these on a slightly harder grade of paper will greatly emphasize this. Contrast filters, such as a red filter are very useful for isolating objects against what will appear to be a black

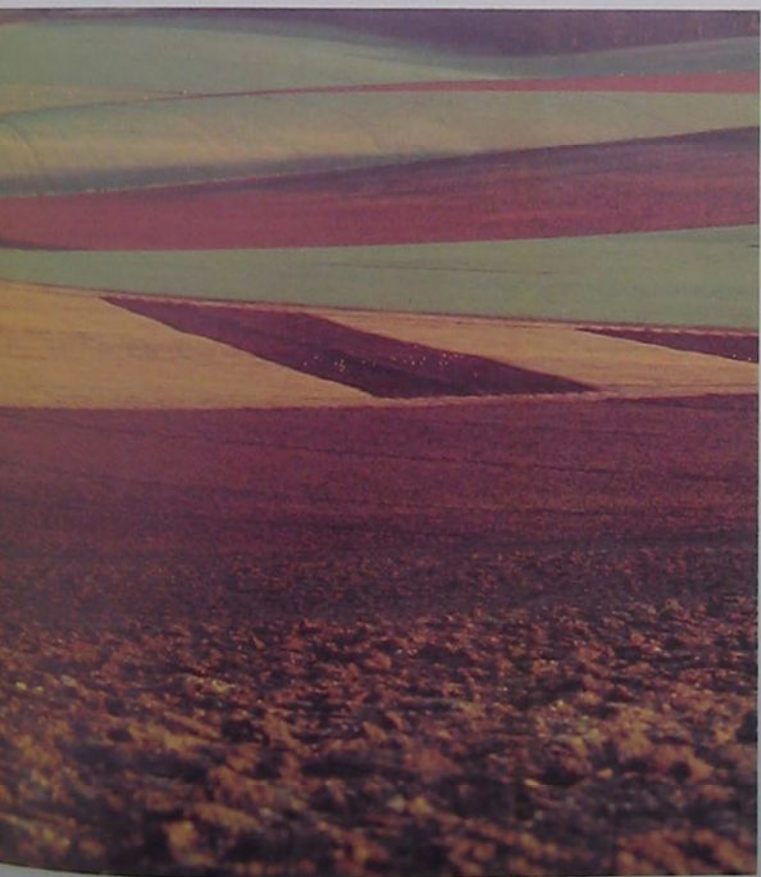
properties such as the glossy metallic paintwork of a car, or a simple curved shape of flat colour.

Graphic compositions often rely on strong geometric arrangements of shapes for their effect. There are numerous occasions when such strong lines can be used to produce a strong but simple image. A frame within a frame is a popular device for doing this—perhaps

a landscape framed around an open car window or framing a group of yachts through a porthole.

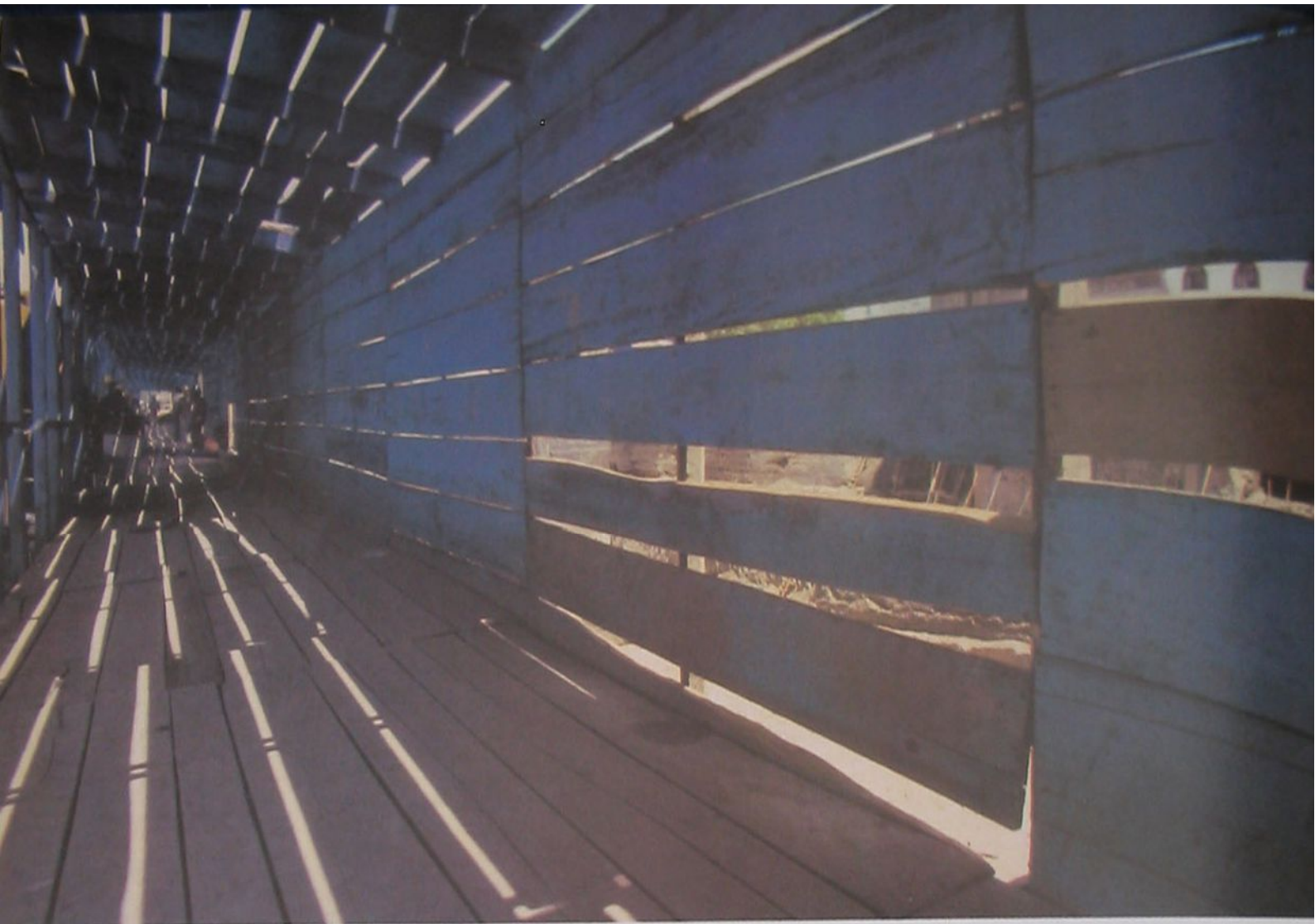
However, one way of producing a similar effect where there is no complete frame available is to include a bold horizontal or vertical line in the foreground, balanced by the background. In a wooded area you could include a tree trunk bisecting the

Five birds Telephoto lenses are ideal for isolating details and composing them into graphic images—underexposure gives a strong silhouette effect. **Landscape** Similar techniques can be applied to landscapes, using a telephoto to pick out the patterns in a group of fields. **Paintwork** Brightly coloured metalwork is ideal for graphic work—it can be effective to tilt the camera



Ian McKinnell





sky, to give shots a dramatic, harsh feel.

This graphic approach to designing photographs can be applied to any subject, from landscape to portraiture. Look closely at the details that make up our world. Investigate a busy shopping street—the advertisements, the window displays, the buildings, parked cars, lorries and coaches. Concentrate on what you find to be the most interesting

aspects and isolate them in your viewfinder, moving the camera until you find the best viewpoint. Look carefully at objects that have been well designed, from clocks to cars: look at the way the designer has approached the details, the texture, the shape, even the lettering. Look carefully at a new car for example—notice the difference between one that has been designed from a purely

Light between the cracks *A subject like this is highly suited to graphic images but the success of this shot comes from a carefully chosen viewpoint*

functional point of view, and contrast it with a model designed from a purely aesthetic standpoint. Note the care with which small finishing touches have been chosen—the fit of the petrol filler cap, the door handles, the wheels.

In a rural landscape look for patterns and shapes in the trees and hedgerows, the graphic marks of a ploughed field. Use your longest lens and explore every detail of the scene for the design elements that make up the overall scene. Try and tell a story in the most simple and striking way possible. For example, you do not need to photograph someone's entire body to show their personality or what he or she looks like. Concentrating on just one area may be more revealing, and make a stronger picture. Look at the hands or the face, or moving in closer still, perhaps just the nails—the long smooth, perfect nails of a model, the dirty, chipped nails of a mechanic. Often the most interesting images are those that do not show everything, but those where a certain amount is left to the viewer's imagination.

Road markings *You can exploit a high viewpoint to create graphic compositions of the world below—again a telephoto allows selective framing*



What went wrong?

Unusual views

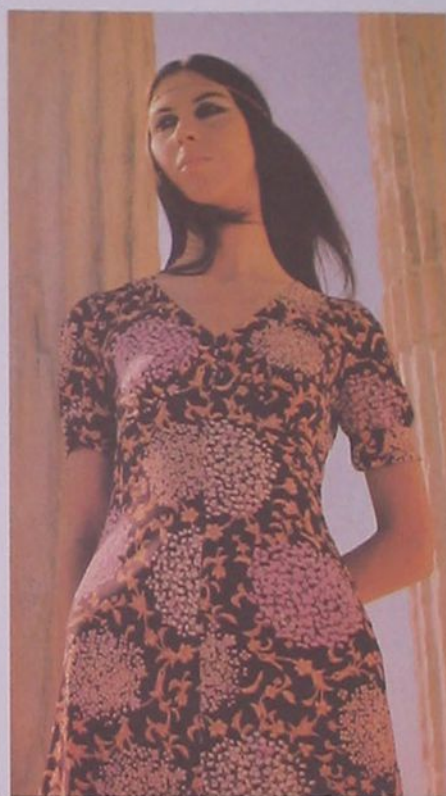
In trying to take a creative photograph, many people resort to unusual viewpoints. But they do not always work out, as Homer Sykes shows in his criticism of some amateur photographs



The unusual angle that this photograph has been taken from makes the swimming pool and balconies almost completely unrecognizable. The bizarre angle and lack of thought about the design of the picture, coupled with incorrect exposure, renders the picture very odd indeed.

Judging from the geometric design of the swimming pool and the circular balconies, one would have thought that the photographer could have produced interesting shots without much difficulty.

When photographing buildings like this the best start is to walk around them. Familiarize yourself with the various aspects of the design. Look for good interesting vantage points that show the building off well. Wide angle lenses can be used very effectively



A very boring, unimaginative, photograph that looks like a bad attempt at a 1960s fashion shot. The picture could have been improved had an attempt been made to use the columns in a more interesting way. Cutting the picture halfway down the girl's thighs and posing her with both hands behind her back looks awful.

It would have been better to try this shot with a much wider angle lens, perhaps a 28 mm, but from a greater distance to avoid any distortion. Have the girl walking towards you and shoot lots of frames from a low angle, making sure that the building in the background looks good as well



Of the four pictures on this page, to my mind the unusual angle here has worked extremely well. What a good way to take a family shot.

Unfortunately, the framing is a little on the tight side. It is a shame that the front of the toy car and the woman's legs have been framed out. Presumably the picture has been taken from an upstairs window or from over a wall. A wider angle or zoom lens would have been ideal in this situation. Extra height could have been gained by simply standing on a chair.

The woman to the left of the picture could have been looking up a little if more time had been taken in posing this photograph. This is a good example of a shot which would have been fine, if only...



This nude is something of a disaster. It reminds me of a similar photograph by Bill Brandt from his remarkable book *Perspective of Nudes*. In Brandt's photo, the unusual shot worked beautifully, but here it does not. Instead of looking at a subtle romantic photograph of a girl on a bed the photographer has created a dark and depressing picture that I suspect is the very opposite of what he felt.

The picture could have been better if the girl had been farther down the bed so as to make use of the window light and if the photographer had moved back a little so as not to cut off her right shoulder and her hair. With a slightly higher angle to show more of her body the whole effect would, I think, have been much improved



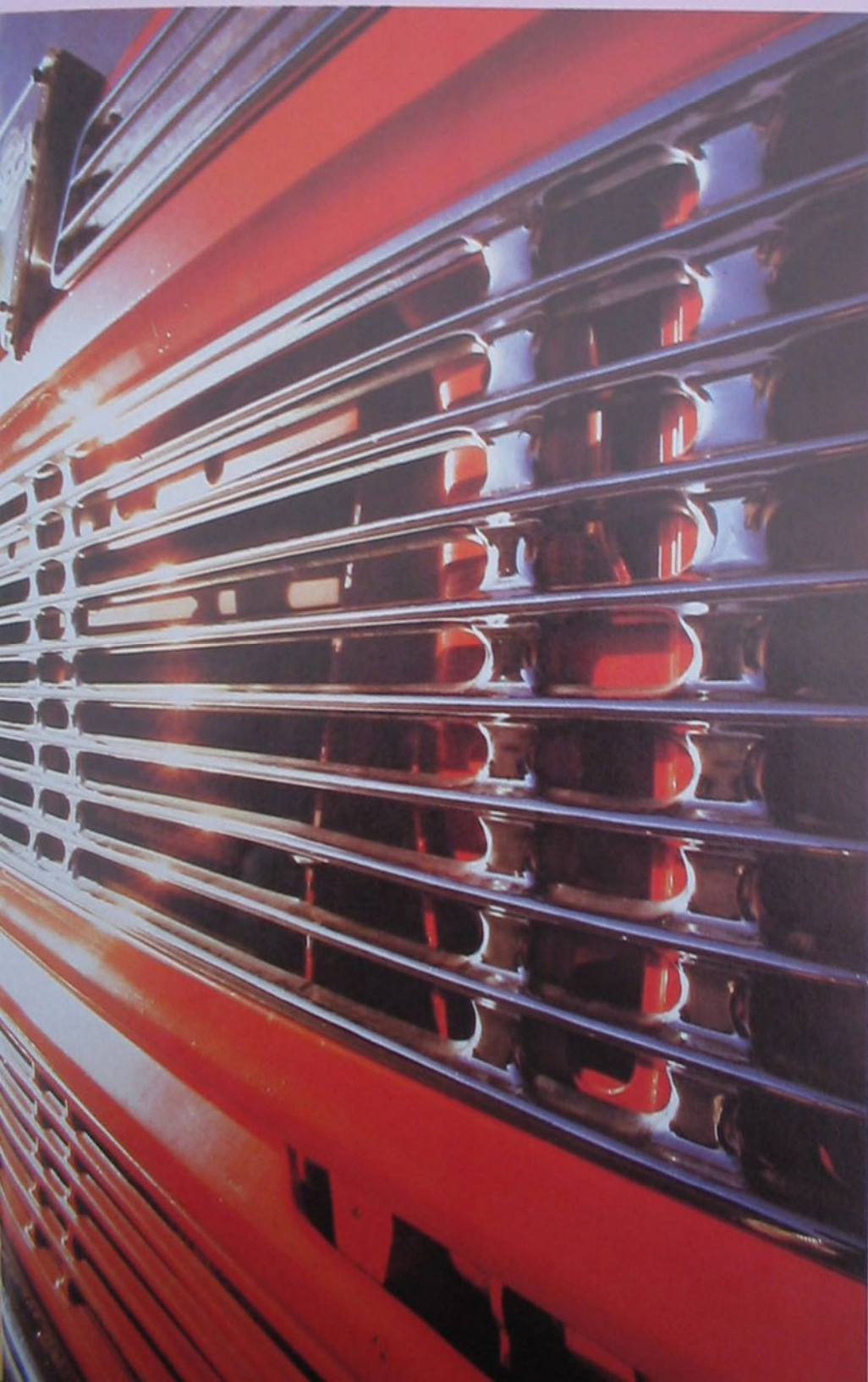
Dillon Hall



Creative approach

CREATIVE CLOSE-UPS

By turning your camera on the fine details that make up our surroundings you can produce creative images of interesting subjects that might otherwise go unnoticed



Most people do not look closely at what is going on around them. They miss out, therefore, on many of the small scale aspects of the world about them. This is a world that close-up photography can reveal—in fact it can go further and show more than the unaided eye can ever appreciate.

Close-up photographs vary widely in terms of scale. For example, by using a very long telephoto lens it would be possible to isolate a detail from something as large as the Statue of Liberty. Although the photograph may cover as much as a few square metres, it would still be a close-up in a relative sense. However on a much smaller scale, to fill the frame with an object as tiny as a daisy, you would need to use special close-up equipment so that you could work at a distance of only a few centimetres. But close-up photography can go further still—you can shoot subjects at a scale more than life size, so that the subject can lose its identity and you begin to enter the realm of photomicrography.

Close-ups do not demand the use of any particular type of lens. Wide angles, standard lenses, telephotos and even super telephotos are all suitable, though extension tubes or bellows are often necessary to make the most of them.

The art of taking close-ups is quite separate from the science. It is not enough to demonstrate your technical skill in the subject—creative close-ups demand both practical skill and an artistic eye. There are hundreds of potential close-ups around all the time, but most of them will not make interesting subjects. The successful detailed image is more than a simple record of how something looks—it is a careful selection of part of a scene to draw the viewer's attention to the way something looks in detail. The close-up should make the viewer aware of some feature of the world that never occurred to them before.

This is what the photographer is often trying to do anyway—to select part of the scene that is particularly interesting. But in the case of close-up photography there are even greater demands on the photographer's skill and perception. Close-up work is an art form peculiar to photography—there is comparatively little conventional art that concentrates solely on details in the same way. The way the lens and film view the world is different in many ways from the way the eye sees it. For example, the shallow depth of field that is inevitable in much close-up work can produce images which can never be seen by eye as such. This means that the close-up photographer must learn to see the world in the same way as the lens and film, in order to spot pictures which would

Chrome grille Careful choice of viewpoint and use of an ultra wide angle lens created a striking close-up shot of the bright paintwork and the sparkling chrome grille of this commercial vehicle

Ed Buziak



Tony Jones/Robert Harding Picture Library



Madrone bark The texture of tree bark is a particularly good subject for close-up work.
Bottle Here an everyday subject has been used to create an unusual but intriguing study in shape and colour—its true identity is irrelevant

otherwise be missed.

Imagine a pebble lying in the middle of a road, on a tarred surface. From eye level it appears totally mundane: and even from road level it is little better. But look through the viewfinder of a camera fitted with a standard or telephoto lens and extension tubes, so that it fills much of the field of view, and the pebble is transformed. The shallow depth of field renders the background as a complete blur, and in fact the only sharp features are the pebble itself and a thin strip of road surface parallel to the film. The pebble appears to be a rock sitting in a rough black tarry sea, whose undulations take on a new character.

An extension of this approach is to photograph everyday objects so that they become virtually unrecognizable. Such photographs are often used as 'what is it?' puzzles, but they can be more than just games—they can show how we never really look at fine details of

objects, and cannot recognize even parts of a telephone or bathtub without seeing the overall context.

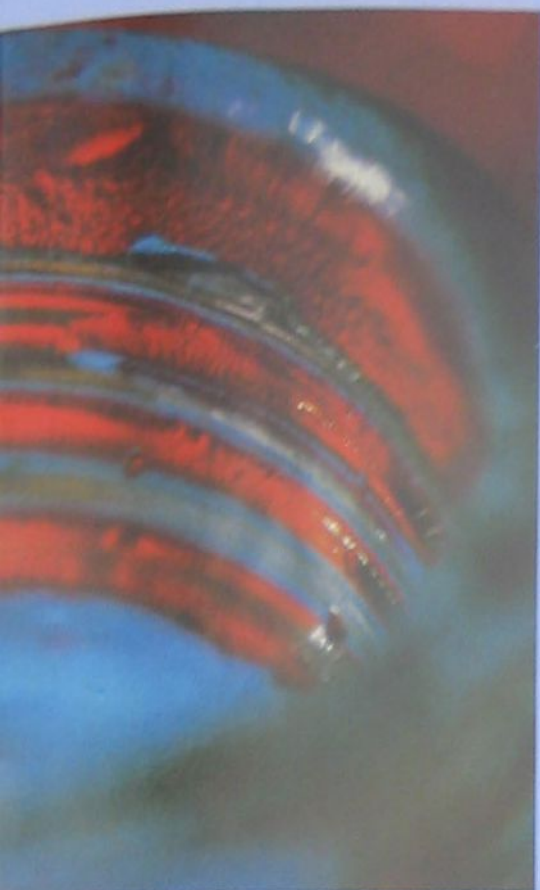
Seeing such photographs in the world around us is a considerable challenge, and needs considerable practice. One way to start is to take a less extreme view, and explore everyday objects for interesting details. A car or motorcycle, is a case in point—particularly when brand new. The details of such features as the tread on the tyres, the moulding of the headlamps and the gleaming grilles are all worth looking at. The important thing to decide in each case is what makes a feature attractive. Only then can you move close in to emphasize that feature. However, even at close range it is important to pay attention to the overall composition and to the shape it forms in the viewfinder. Often it will not matter about whether you angle the camera to make the best picture you can since the subject has already been taken

out of its normal context. If in doing so you make it just a little harder for the viewer to decide what the object was in the first place, you have introduced an element of trickery into the picture, and this may hold attention further.

At such close range, texture and pattern become very important—you might, for example, look at the weave of a piece of cloth or the bloom on an apple. These are all features which we see around us, and which we probably appreciate without knowing it. The photograph selects them, and in the case of extreme close-ups makes them easier to see. A huge variety of subjects can be treated in this way, from the stones, moss or brickwork in a wall to the folds of skin on a tiny baby's hand.

You need not even be very close for this sort of work. You can use a 400 mm or longer lens, with extension tubes or bellows if necessary, and pick out details of a building or a tree way above your head. The same technique can be useful when taking candid close-ups of people, such as guardsmen on parade.

At the other extreme, some very striking close-ups can be taken using a wide angle lens. Most wide angles focus quite close anyway, and by using even a short extension tube you can move very close indeed to your subject. At the same time, the wide depth of field retains detail in the background, setting a small

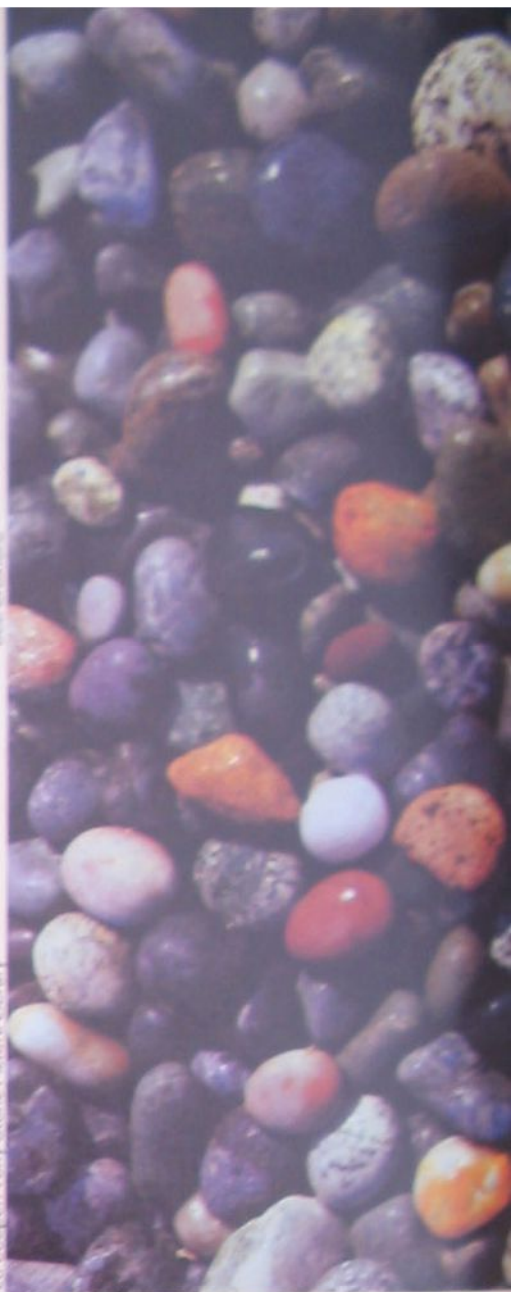


Red leaves Sometimes the striking colours of nature can only be appreciated at close range. **Butterfly wing** Here an extreme close-up revealed the vivid colours and the delicate texture of a butterfly's wing to an extent not normally visible





Bob Crossland



Ed Cooper/Tony Stone Picture Library



David Parker

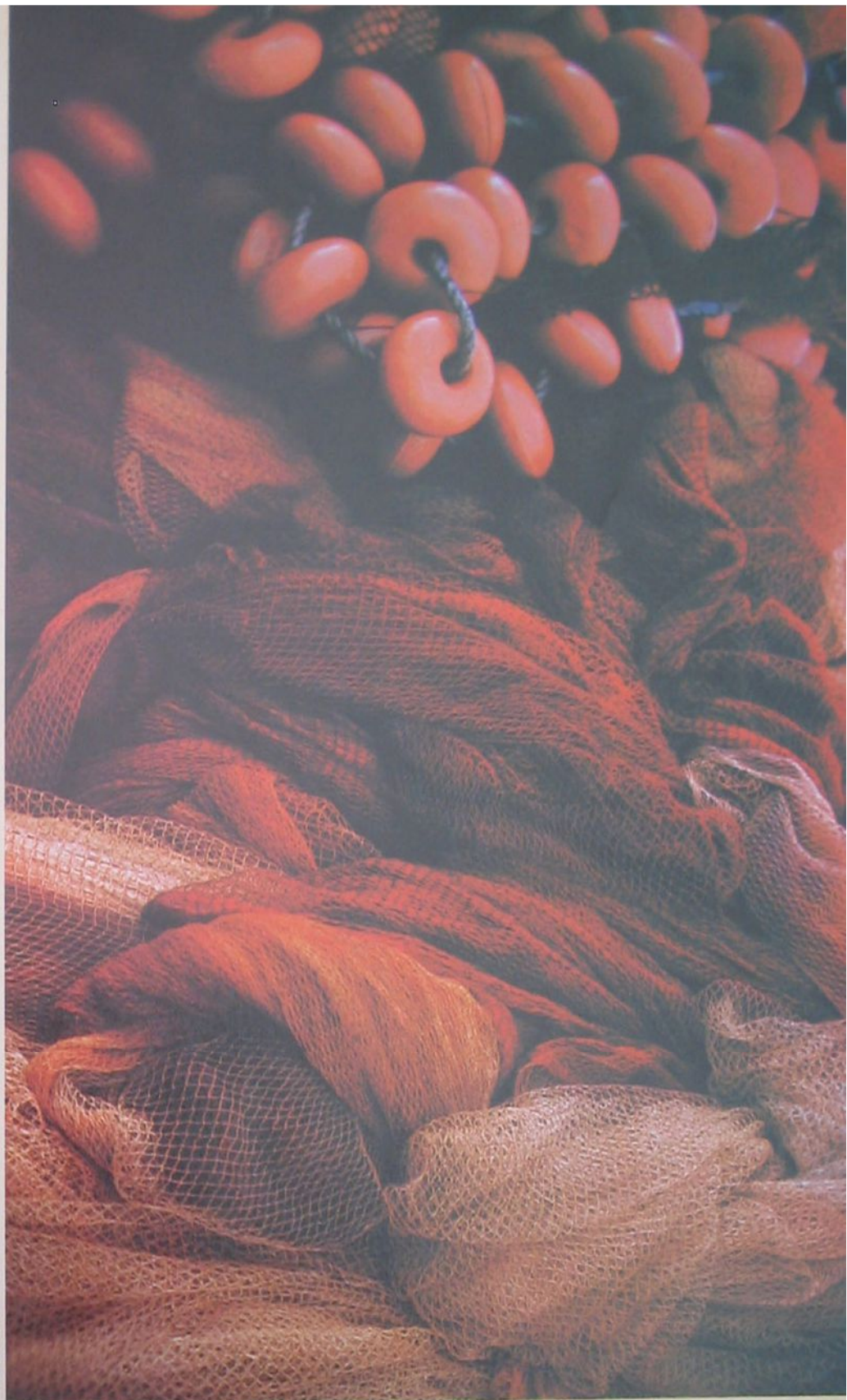


L. West/Frank Lane Agency



Iron hinge Special equipment is not always necessary—close-up photography is equally dependent on an eye for detail. **Boiler door** The combination of the rusty ironwork and the pleasing antique design is best appreciated without the distracting surroundings. **Pebbles** Sometimes subject matter may lie at your very feet, but do not be afraid to rearrange small details to make a better photograph. **Fern** Composition is as important with a close-up as with a broad landscape. **Fishing nets** A short telephoto or a zoom lens can be ideal for moving in and isolating attractive details and textures

John Sims



object in its context. This can give a 'worm's eye' view to objects which, again, is impossible to perceive by eye alone since the eye just cannot focus that close.

In the natural world this technique allows you to show the countryside as a small animal would view it, or to turn the tiny stems of moss into a forest of tree trunks on a range of hills. You can explore totally new dimensions of the familiar objects around you in this way. One way of relating these close-up

details to their natural habitat is to use a split image attachment. This is basically half a close-up lens and allows you to focus on a small flower, for instance, while keeping the background in focus.

With large format cameras it becomes possible to obtain great depth of field, as the lenses can be stopped down much further than 35 mm lenses without loss of definition due to diffraction. Such images can appear stunning simply because, again, the eye is incapable of seeing close-up objects with great depth of

field. At the other extreme, you could experiment with close-ups which are deliberately defocused and make solely abstract colour studies.

The close-up world has an unlimited range of subject matter, and its value is that it often forces you to use the camera as far more than a means of recording what you see in front of you. You must strive to achieve technical excellence and develop an eye for details that anyone else might miss, and also know just how the lens and film will behave.

The carbro process

Monochrome and trichrome carbro are forms of an interesting transfer process which results in pigment prints of a fine, almost three-dimensional, quality

The carbro process evolved at the turn of the century, but it remains in use even today. It gives colour prints of the quality and permanence of dye transfer, but costs significantly less. And although considerable skill is required, once you are experienced you can exert considerable control over the image.

The carbro process is a transfer process by which the metallic silver image of a fairly ordinary black and white print is converted into an image composed of pigmented gelatin. As well as allowing you to choose image colour, the process greatly enhances the appearance and quality of the image. These characteristics are much prized in top-level pictorial work. But the process is now mainly used to produce colour prints by successive printing of three separate pigment images in the colours yellow, red (magenta) and blue (cyan). It is used in preference to conventional colour printing where image permanence and quality are important.

Monochrome carbro

A single colour carbro print begins life as a bromide print made on paper which does not have anti-abrasion supercoating. You can try ordinary fibre-based or RC bromide paper but the supercoating of these may cause loss of

subtle highlight detail and general patchiness. It is best to use proper paper—this is often available under the descriptions 'art', 'document' or 'mural'.

Make a print with your black and white negative reversed in its carrier as the image is reversed during the later transfer stage. Allow a 'handling' border of at least 25 mm around the desired image area. The print image must contain a full range of tones and, if anything, slightly on the soft side in order to obtain a good carbro print from it. Give it full development, adequate fixing using a non-hardening fixer solution, followed by a really thorough wash.

Next, prepare the special pigment paper which consists of pigmented soluble gelatin coated on a paper base. This is available in black and in several colours (for suppliers see inside front cover).

Cut a sheet of this slightly larger than the bromide print you have made. The pigment paper is then sensitized. Do this by soaking the paper for up to ten minutes in a dish of cool water, followed by a single or two bath sensitizing solution, such as listed here (see panel). Use solutions at room temperature. The pigment paper is slightly light-sensitive after this treatment and, while you can work in normal room lighting, avoid very

strong natural or artificial light.

While the pigment paper is soaking, wet the bromide print if you have put this aside to dry. Leave it soaking for about ten minutes and, before the end of the 2 or 3 minute pigment sensitizing period, remove the print from the dish and place it face up on a fairly thick sheet of plate or float glass. Use a flat-blade squeegee to 'stretch' the print in all directions outwards. Then cover the entire print in a shallow pool of water. Drain the pigment paper and, if you are using a two-bath sensitizer, pass it quickly through the second bath, before letting it drain off again. Then lay the pigment paper on the bromide, bringing one edge into contact first, pushing the print down with the squeegee until, finally, the opposite edges come into contact. Do this in one swift action.

The chemical reaction that then takes place begins immediately on contact so it is important to bring all of both surfaces together quickly. Use a flat squeegee to bring both surfaces into all-over contact and to expel any trapped air bubbles. Then sandwich them together between greaseproof paper beneath another sheet of glass, using slight pressure, for between five and 20 minutes depending on how long it takes for bleaching.

The pigment image can be transferred to any good quality gelatin-coated paper—even on to a sheet of acrylic, in fact any plastic which has suitable surface characteristics. If paper is being used soak this for at least ten minutes in cool water before placing it on the glass.

Now carefully separate the bromide and pigment papers—you will see that the print image has bleached. The reaction which has taken place is a complex one which makes the pigmented gelatin insoluble in direct proportion to the density of the image. Thus in dark areas, the gelatin of the pigment paper is hardened to a greater depth than in light parts of the image. The soluble gelatin is removed in a later

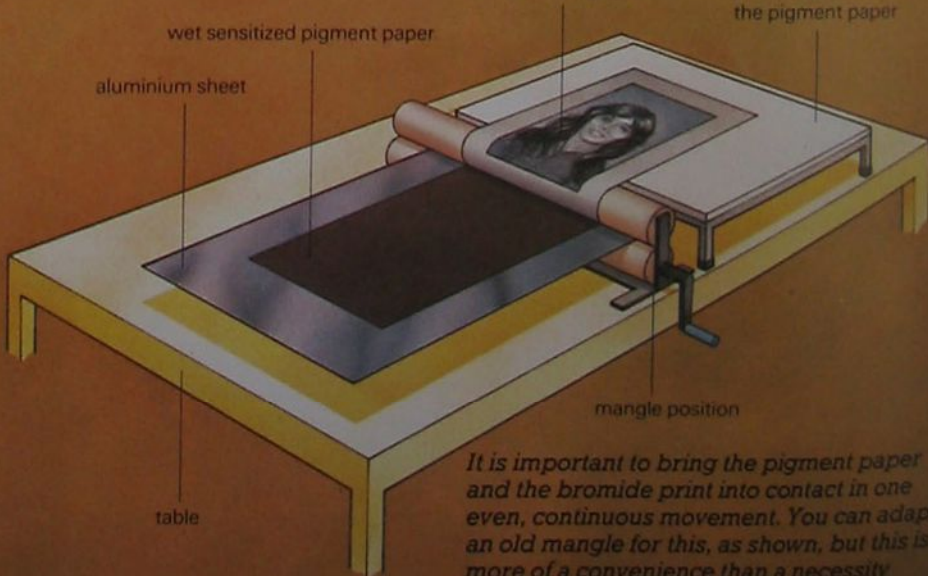
Sensitizing bath formulae

Solutions	A	B	C
Water	500 ml	750 ml	15 ml
Potassium ferricyanide	16 g	50 g	—
Potassium dichromate	12 g	50 g	—
Potassium bromide	8 g	50 g	—
Succinic acid	2.4 g	—	—
Potassium alum	1 g	—	—
Acetic acid (glacial)	—	—	10 ml
Hydrochloric acid	—	—	10 ml
Formalin (40%)	—	—	220 ml
Add water to make			

Single bath formula This uses solution A at stock strength and at between 8 and 14°C. Immersion time is between 2 and 3 minutes

Two-bath formula This uses separate stock solutions B and C. A is diluted 1 + 3 with water, and paper is immersed for 3 minutes in this before being passed for 15-25 seconds through solution C, diluted 1 + 32—but establish an exact time. This formula is more convenient for large prints

Using a mangle for printing



stage of the process, which involves 'development' in hot water.

The bromide print can be discarded or returned to a dish of water for later redevelopment—as many as five carbros prints can be produced from a single original, but quality deteriorates with each cycle.

Soak the pigment paper and bring it face down in contact with the transfer paper using the same procedure as before. Squeegee the two in to all-over contact and leave them to dry, under light pressure, for up to 15 minutes.

Prepare a dish of hot water between 40°C and 50°C and immerse the pigment and transfer paper sandwich in this. When you notice pigmented gelatin oozing out, carefully peel the two apart—but take care and do not use force. The image now on the transfer paper is then washed free of remaining gelatin—but avoid rubbing the delicate surface in any way or the image may be ruined.

When 'development' is complete, quench the print in a dish of cool water and then transfer immediately to a weak solution of sodium metabisulphite to

clear the yellow dichromate stain. Wash the print briefly and then pin it up to dry.

Trichrome carbros

Claimed to be one of the most beautiful of all colour print processes, *trichrome carbros* is a natural extension of single colour carbros printing. In general, the procedures employed are the same as those for single colour carbros except that you work from a colour original, via a set of colour separation negatives from which three black and white prints are produced. These bromides are used to produce gelatin images on yellow, red and blue coloured pigment papers which are referred to as yellow, magenta and cyan. Several image transfers are then made, in register, to build up a full coloured image on almost any flat surface coated with gelatin.

Although trichrome carbros has been largely superseded in professional use by the dye transfer process (see pages 1884 to 1889), it is probably a much easier process for the enthusiast to attempt. Material costs are far less and, as only two dishes need ever be in use at

once, no unnecessary expense in terms of quantities is needed—nor do you need a great amount of working room.

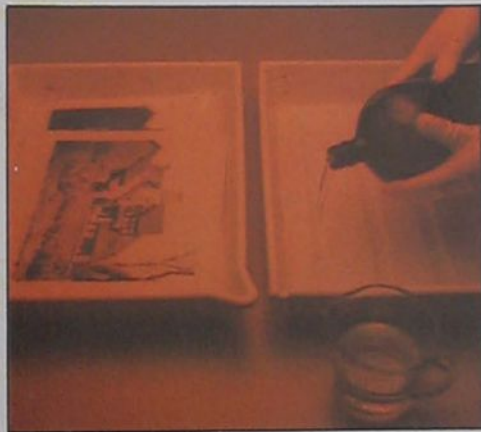
The first step in this process is to produce a set of colour separation negatives (see page 2276), and, from each, to make one bromide positive print as before, on paper which does not have an anti-scratch supercoat. Print each image the correct way round, with the paper grain or texture running in the same direction, to avoid poor registration in the final image. Handle prints carefully to prevent scratching.

Prints of perfect quality are essential. Aim for images with a good range of tones and detail in both shadow and highlight area. Once tests have been made, the final set of prints—the 'bromides'—should be processed together. Development time must be standardized as even the slightest variation can show up in the final reproduction as a colour distortion. This is most easily achieved by processing prints together. Transfer the prints to a dish containing non-hardening fixer, if possible via an intermediate rinse in acid stop bath.

Making a carbros print



1 Although most items of equipment and materials are readily available, special pigment paper must be obtained from the West German manufacturer (see text)



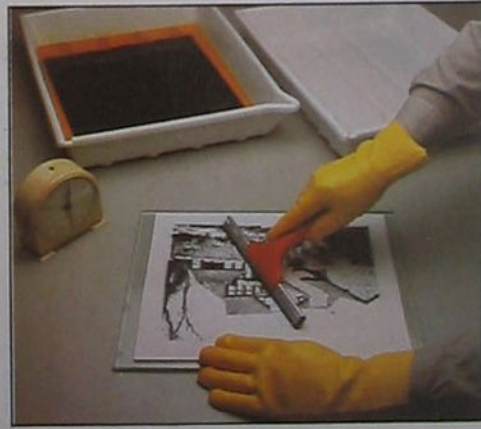
2 Make colour separation negatives by enlarging your transparency on suitable panchromatic film and contact print these on non supercoated bromide paper



3 Wash the bromides thoroughly—use hypo clearing agent if possible—and hang prints to dry in the same manner. The 'blue filter' bromide is densest



4 Cut pigment paper larger than its corresponding bromide. Soak both in cold water for ten minutes (top right) once the sensitizing bath is ready (top left)



5 Use a flat blade squeegee to stretch out the 'red filter' bromide on glass. Wipe outwards in all directions. Then cover the print in a pool of water



6 Remove the pigment paper at the end of sensitizing. Bring the tissue into contact with the bromide. Squeegee and leave 15 minutes, under pressure

Follow this with a long and thorough wash—at least half an hour in running water. Any trace of fixer will ruin the result, so it may be worth using hypo clearing agent if you are not sure it will be washed away thoroughly.

The bromides are now ready for pigment printing or drying. For drying, hang prints in the same orientation and by the same method to ensure shrinkage is consistent.

Image control

The print making stage is probably the point at which you can control the appearance of the final image most reliably. Like all 'part image' processes—particularly dye transfer—significant adjustments can be made to the density and contrast of any of the print images by varying exposure and development. All possible steps must be taken to produce a set of bromides which have a matching scale of grey unless colour distortions are acceptable. Some separation sets may give matching bromides with no difficulty—but 'rogue sets' require careful exposure and

development to give even results and may have to be remade a few times.

It is normal practice to base the exposure of the bromides on that needed for the print made from the blue (cyan) separation. Expose this to obtain just the slightest veiling of highlights in parts of the image which actually contain little or no blue—easily checked if you have a colour proof print of the original slide, or from memory if the subject is familiar to you. Then expose and develop the yellow and red (magenta) bromide printers to exactly match the scale of grey obtained for the blue (cyan) printer. This matching up is easily done by eye. The result need not be three similarly dense prints—only the scale of greys need matter.

With separation negatives of equal density and contrast, simply give equal exposure and development. Alternatively, use a spotmeter reading of a comparable region of each separation negative to determine any exposure compensation needed to obtain matching density in the corresponding scale of grey in the print.

Colour transfer

Next, cut an oversize sheet of pigment paper of each colour and, as before, presoak this before the sensitizer bath. While this is going on, soak the bromides in cool water if they have previously been dried. Squeegee pigment paper and bromide papers together, dealing with each colour in turn. Remember to bring the halves together quickly and, without trapping air bubbles, leave the three sandwiches under pressure for up to ten minutes to allow the bromide image to bleach.

From this point, the techniques you use differ slightly from single colour carbo work. Instead of being rolled on to paper, the pigment sheets are squeegeed on to individual clear plastic transfer sheets. These are necessary for visual registration of the final image components formed by the yellow, magenta and cyan pigment sheets. Flexible acrylic sheet is best for this purpose. You will need three sheets for each printing run. Cut these slightly larger than the print image size from which you are working. Some plastics



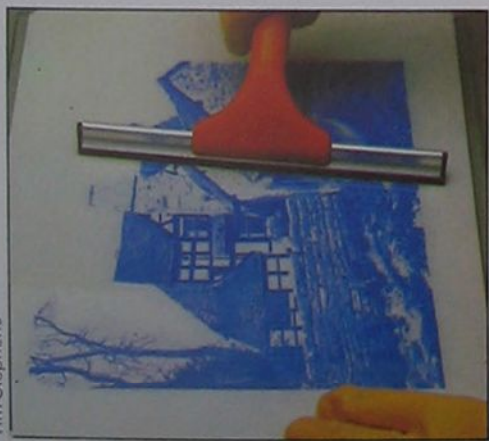
7 Prepare the plastic foil or sheet used for transfer and place this in a dish of water. Place the print-tissue sandwich in this and remove the bromide carefully



8 Next, place the tissue face to face with the 'keyed' surface of the plastic, under water. Removed both together and squeegee the sandwich on glass



9 Leave the plastic-tissue sandwich to bond, under pressure, for 25 minutes. 'Develop' the sandwich in warm water—pigment then adheres to the plastic



11 Soak the temporary support paper in cool water. Then soak and bring into contact the blue image sheet. Withdraw the two and squeegee firmly. Leave to dry



12 Again soak the now blue printed support paper, soak the red image sheet and slide this into image register. Withdraw the paper and sheet, squeegee and leave to dry



13 Repeat the sequence using the yellow image sheet. When dry the plastic sheet simply springs away. You now have a three-colour, reversed image

may need a once-only keying to hold the transferred gelatin. Use metal polish to scour the sheet then detergent to remove this. Finally, rinse off all traces of detergent.

Carefully peel off the bromide half of each print-tissue sandwich, and then resoak the pigment sheet in a dish of clean, cool water, before rolling it down on its own plastic sheet. Then leave these under light pressure to dry.

After about ten or fifteen minutes, the pigment sheets should be stuck firmly to the plastic sheets, and are ready for hot water development, as before. After a few moments you should be able to remove the paper from the plastic—but do this carefully. After all the surplus pigmented gelatin has been washed away, quench the image by plunging the plastic sheet into a dish of cold water. Then set it aside to dry. Repeat the operation for the other two colours.

Next, cut an oversize sheet of specially prepared paper known as the *soluble temporary support*. (You can make this yourself by coating smooth paper with a gelatin solution.) Soak this in water at



room temperature to swell the gelatin coating. Place it, gelatin down, on a sheet of clean glass and use a flat-bladed squeegee to stretch the paper in all directions. Work from the centre outwards. Return the sheet to its dish of water.

By now the pigment images should have dried on their respective plastic sheets. Take the cyan image and place this face upwards in a dish of cold water. Take the sheet of temporary support paper and place it face down on top of the cyan image. To avoid trapped air bubbles withdraw the plastic and paper sheets together, one centrally on the other. Squeegee these two firmly together and leave the sandwich to dry. When it is dry, the paper should come away easily, taking with it the cyan image—now laterally reversed.

Now, place the magenta image sheet face up in the dish in cold water, and the support paper with the cyan image face down on this. After several minutes, withdraw the two. Look through the plastic sheet to register the magenta image with the cyan. You can bend the sandwich if necessary to compensate for any slight differences of image size—this is a major advantage of the process. Errors of several millimetres can be accommodated by bending the plastic sheet one way or another. When the images are in register, squeegee the plastic and paper firmly together and leave the sandwich to dry. Then repeat the sequence for the yellow image.

Now you are ready for the last stages of the process. Cut an oversize sheet of *final support paper*, which is paper coated with insoluble gelatin. Soak this for ten minutes in warm water and bring it into contact with the temporary support bearing the three images, in a tray of water at room temperature. Withdraw the two together, squeegee the sandwich and put it aside between blotters and under pressure to dry. When this is almost dry prepare a dish of hot water between 40°C and 50°C and immerse the sandwich in this. After about half a minute try lifting a corner of the temporary support. If it sticks, leave the sandwich for a little longer and then

Trichrome carbro Careful manipulation of either the original separations, the bromides, or pigment sensitization can give colour reproduction of outstanding quality—but real care must be taken over image registration for good results

try again. Take the greatest care when stripping the temporary support, as it is possible to tear it and ruin the image. Once you have finally removed the temporary support, discard it and then gently bathe the surface of the now transferred colour image with hot water to remove any soluble gelatin that may remain—otherwise leftover pieces of glossy gelatin adhering to the surface will spoil the appearance of the print when it finally dries out.

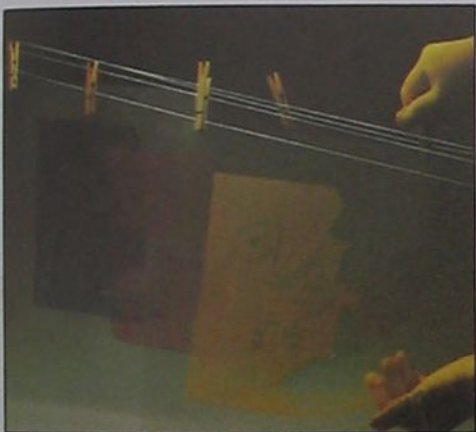
When all the surplus gelatin has been removed quench the print in a dish of cold water for half a minute. Then place it in a dish of formalin for a couple of minutes to harden the gelatin. Shake the print free of surface droplets and place it face up on a sheet of glass, tape the edges and leave it to dry.

When dry, the colour print can be spotted and retouched as required. Do not subsequently use traditional wet-or-dry mounting methods.

Special techniques

As suggested, a considerable amount of image control is possible simply by playing around with the original colour separations. Colours and tone areas can also be modified by retouching, and by masking individual separation negatives before printing the bromides.

Montages are also possible. These can be made as late as the final support stage—but the technique requires considerable skill and practice. The images to be montaged have to be accurately cut out—usually on a light-box—immediately prior to final transfer. Each image has to be placed on the final support when wet, and then squeegeed firmly in place. As it is not possible to leave a safety margin around the individual images, take particular care when removing the temporary support to prevent the image frilling and even its total loss in the final rinse.



10 Complete, in turn, the blue (cyan), red (magenta) and yellow transfer sheets and allow these to dry naturally and without heat. Hang them all in the same way



14 Soak final and temporary supports together in cool water, emulsions facing. Remove and squeegee both together, let them bond, then 'develop' in hot water

Video recorders

Video is the recording medium of the future, and many amateurs will have to get used to the complexities of video heads and helical scans, rather than the more familiar shutter speeds and film gates of movie cameras

Unlike a conventional movie camera, a video camera does not provide a record of a picture sequence. To store the sequence, the signal from the camera must be fed into a Video Tape Recorder (VTR). Although, as the video revolution gathers momentum, VTRs are becoming a familiar sight, their workings remain something of a mystery. But to exploit the potential of video to the full, it is important to understand the basic principles.

All tape recorders work in essentially the same way. The recording tape, usually plastic, is coated with powdered magnetic material—most commonly fine grains of iron oxide, each forming tiny magnets. The recording head is a small electromagnet with a tiny gap at the place where it contacts the tape. The head is energized by the electrical signal to be recorded, so the magnetic flow across the head gap varies with the signal. When the tape moves over the head, the magnetic pattern of the grains on the tape is rearranged by the varying magnetic flow across the head gap. The electrical signal is therefore recorded in the new magnetic pattern on the tape. To play the recording back, the tape is

Tape pattern With helical scan, the video signal is recorded as diagonal stripes across the tape—sound runs lengthways



Video drum At the heart of every video recorder is the drum, usually carrying two recording heads. This spins so that the recording heads move rapidly over the slowly moving tape

simply passed over a playback head which decodes this pattern in a reverse of the recording process.

Unfortunately, while sound can be recorded in this way by running the tape past the recording head, this does not work for video, because a video signal is more complex.

Bandwidth

A video picture is made up by the different electrical signal from each of hundreds of very small image elements. In the UK, Australia and Germany, for instance, (using the PAL system), the electron gun scans across 625 lines, each with 572 elements, to build up

the picture. So the picture contains $625 \times 572 = 357,500$ elements.

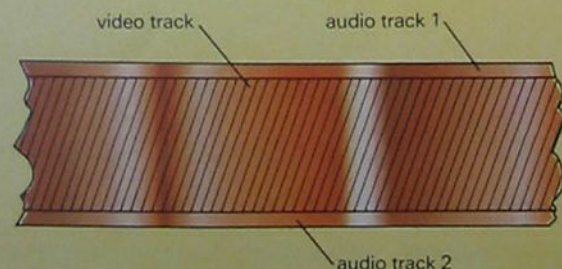
If the scene being shot is completely blank, every element sends out the same signal. But if no two adjacent areas receive the same amount of light, then the camera may transmit up to 357,500 different signals in one picture. Since the camera sends out 25 pictures every second, this means that the video tape recorder must be able to record up to $357,500 \times 25$ —nearly nine million—vibrations a second (hertz or Hz). The possible range of signal frequency, from 25 Hz (with the screen blank) to 9,000,000 Hz (9 MHz), is known as the **bandwidth**.

Theoretically, then, the video tape recorder must be able to record a bandwidth of 25 Hz to 9 MHz. In practice, it is very unlikely that any scene will ever give 9,000,000 different signals in a second and an upper limit of 5.5 MHz is usually adequate.

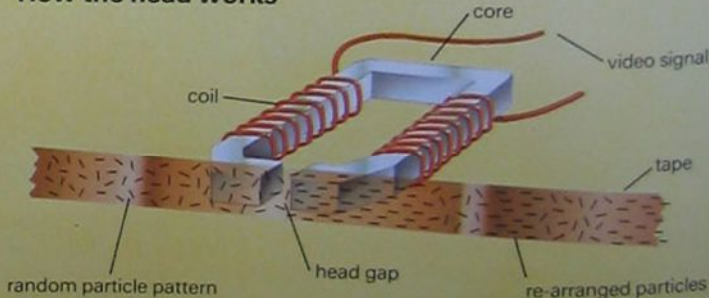
However, a domestic sound tape recorder typically can only cope with a range of 20 Hz to 20,000 Hz (20kHz). So a conventional tape recorder cannot even approach the bandwidth needed for video recordings. The complexity of the

Tape head As tape passes the head gap, the pattern of particles is arranged in response to the video signal

Recording the video signal



How the head works



problem is reduced considerably by changing the video signal from Amplitude Modulation (AM) to Frequency Modulation (FM). This means that the strength of a signal is indicated not by the size or amplitude of the pulse but by the number of pulses in a given time (the frequency). However, the highest possible frequencies are still well beyond the capabilities of the conventional tape recorder.

Conventional tape recorders cannot record high frequencies because at high frequencies each pulse is recorded over a very short distance of tape. With a tape moving at 4.7 cm per second (typical for a cassette recorder), each pulse in a 100 Hz signal would be recorded over 0.47 mm of tape; at 10 kHz, it would be 0.0047 mm. Once the signal is so short that it is less than the head gap, it will not be possible to play it back at all.

The severity of the problem is reduced slightly by reducing the head gap to the minimum. But this is not nearly enough, and the solution has been to pass the tape over the head at a higher effective speed. This means that the tape travels further over the head in a given period of time and so a signal is recorded over a much longer stretch of tape.

High speed tapes

The effective tape speed needed for the video bandwidth was calculated to be 3800 cm/second. So when the BBC produced their first video recorder in the late 1950s, they managed to get the tape to run past the head at this speed—nearly 136 km/hour. But at this rate, the recorder got through tape at a phenomenal rate. Of course, this was totally impractical.

The first practical solution came from Ampex in America. Rather than just move the tape past the head at such high speeds, they rotated the head across the tape as well. In fact, they used four heads and so the recorder was called a Quadruplex. Although it was widely adopted by television companies, the Quad is impractical for the amateur market—a Quad machine is as big as a car. The breakthrough, which made the

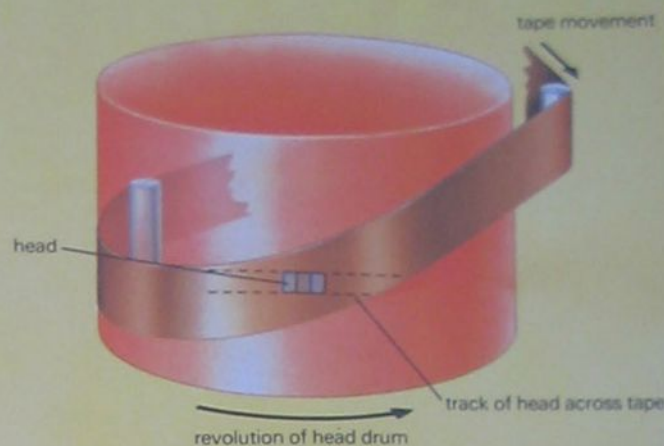
recorder small enough to carry around and simple to operate, was a spiral or *helical scan*.

Helical scan is not universal on amateur video recorders—there are a number of longitudinal running machines on the market, for instance—but it is by far the most common. Helical scan involves passing the tape at an angle across a rapidly rotating head. As the head rotates it makes a diagonal track across the tape. By the time the head comes round again the tape has moved on a little, so it makes another diagonal track, parallel to the first.

For a complete picture signal, the tape would have to be wrapped right around the drum containing the head, and a number of full wrapping designs have been patented, such as the Omega wrap. But this makes loading the tape very difficult—and cassettes almost impossible—so most amateur recorders have two heads and the tape is only wrapped around half way on each. This is quite convenient because each video picture is made up from two complete scans (see page 1842), so each head records one of the scans.

Domestic video machines also have a much more restricted bandwidth than professional, videotape machines and this reduces resolution. The slightly inaccurate timebase and reduced bandwidth are hardly noticeable in practice, except to the experienced eye. But they mean that colour has to be recorded in a different way to professional

Wrapping the tape



Helical scan The tape is wrapped around the rotating head drum to give a high tape-head speed

video recording machines.

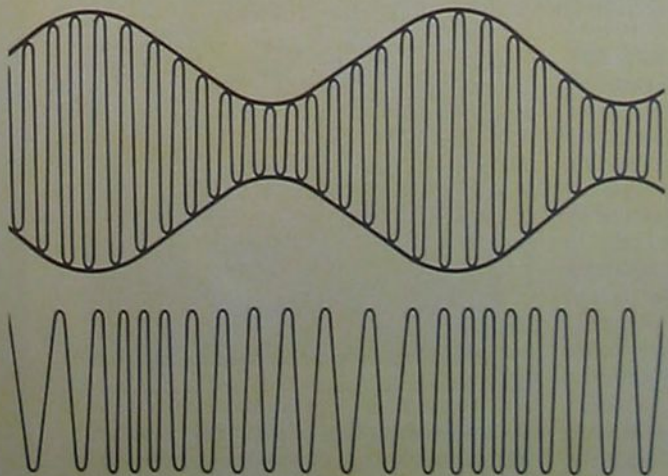
Colour signal

The colour signal from the video camera consists of red, blue and green components. Because the eye is far less sensitive to colour (chrominance) information than brightness (luminance), the colour signal can be very simple and has a narrow bandwidth. To reduce the necessary bandwidth still further, separate colour tracks are not recorded for each of the three primary colour signals. Instead, two *colour difference* signals are recorded. Essentially this means that the red and blue signals are recorded and the television works out the green content electronically by comparing the total red and blue output to the luminance output—since the luminance signal is white, once the red and blue light is

taken away, the rest must be green.

In professional machines, the two colour difference signals are recorded at 4.43 MHz. But in domestic video recorders, the timebase and bandwidth problems mean that a *colour under* or *heterodyne* system must be used. In this system the colour signal is recorded at the lower end of the frequency scale, around 650 Hz, 'under' the luminance signal: the precise frequency varies from machine to machine. Since television signals and video cameras send out the colour signal at 4.43 MHz, this low frequency is achieved for recording in domestic video recorders by mixing (heterodyning) the 4.43 MHz signal with low frequency vibrations from a stable oscillator. It is the combined signal which is recorded.

AM versus FM

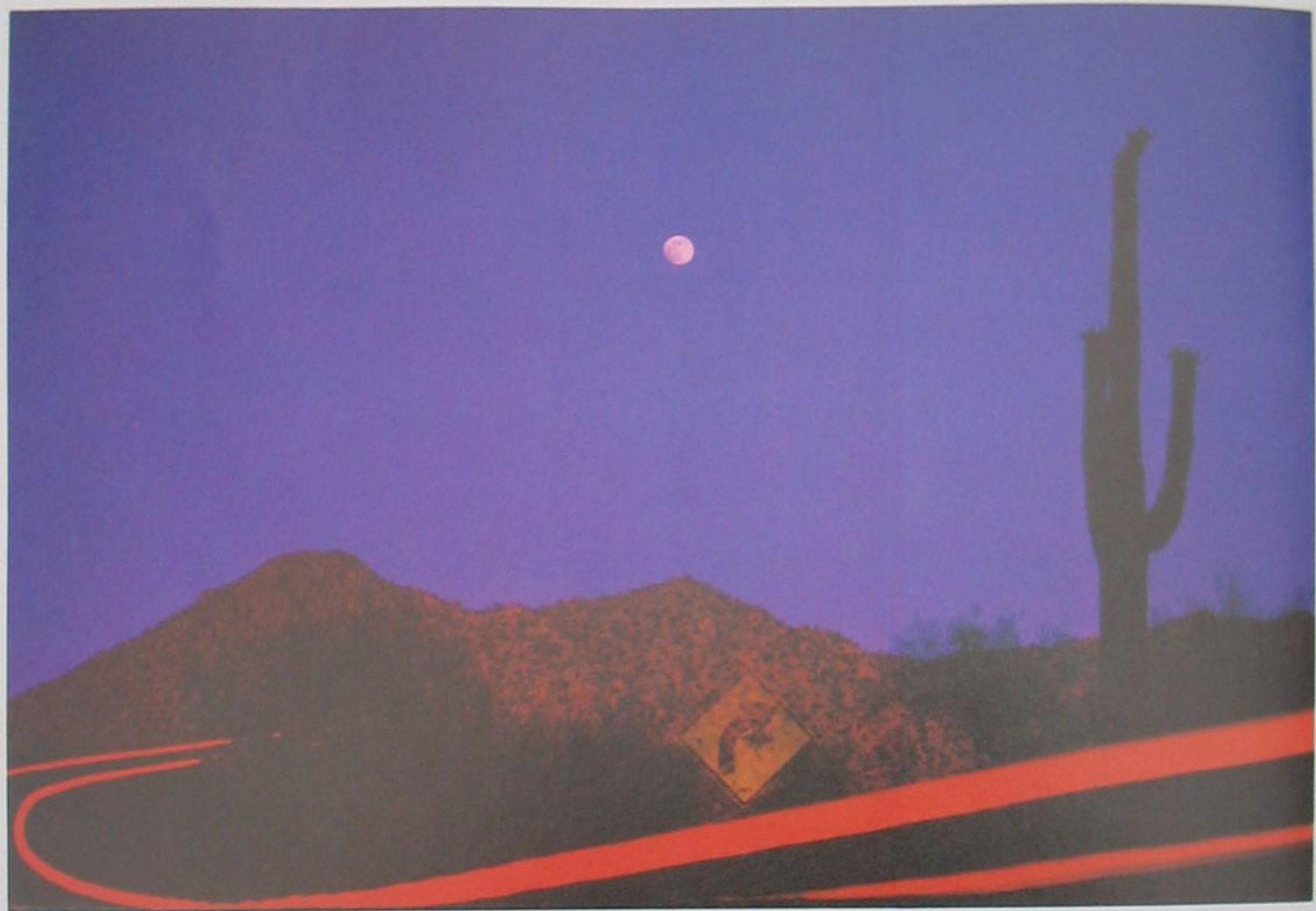


Amplitude modulation This is the simplest way to put a signal on a radio frequency (RF) carrier. The height of the carrier wave varies in step with the signal. But the peaks may suffer distortion

Frequency modulation Keeping the size of the waves the same but varying their frequency allows a greater range of frequencies to be put on the carrier, and allows the full signal-carrying capability of the tape to be used

Al Satterwhite

An eye for the strong graphic elements of a subject and a liking for high contrast and striking colours distinguish the work of the successful New York-based photographer, Al Satterwhite



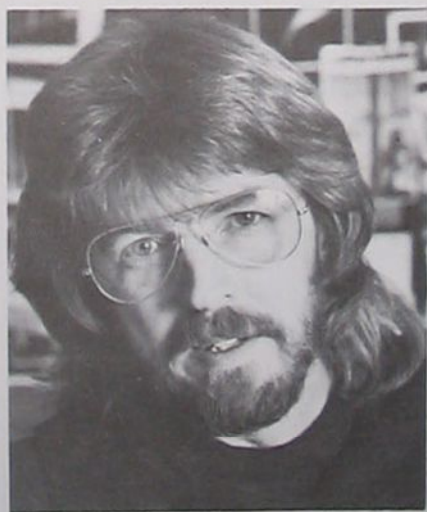
Al Satterwhite

In the world of advertising photography, where the rewards are high and the competition fierce, success is generally based on the elusive and vital concept of personal style. The work of Al Satterwhite is no exception. Over the last decade he has become one of New York's most successful advertising photographers with a highly distinctive style which is much in demand.

It is a style marked, above all, by his pure and intense use of colour and strong graphic design. These are elements which are of prime importance in advertising photography where pictures must hold the eye and draw the viewer in.

Although Satterwhite's work is now almost entirely commercial, his photographic career began in an entirely different field. He spent his early years as a photojournalist based in his home state of Florida.

Although he had always enjoyed photography, and worked as a photographer for his college newspaper, he



Al Satterwhite One of the most successful photographers in the competitive world of New York advertising photography

Arizona landscape Taken just after sunset with a time exposure to catch the car headlights. Satterwhite used an 85 mm lens



Guy Hand

had entered college to study aerospace engineering. He wanted to be a pilot, but after only six months he realized that photography was his real love.

Over the next five years, Satterwhite studied photojournalism at five separate colleges. Then, realizing that studying was not going to get him started, he took a job on his local newspaper at St Petersburg. His freelance work had not prepared him for the hard grind of a full-time staff photographer.

'I got the worst shifts and worked nights and weekends covering everything from college softball games to local dramas. But the great thing about a newspaper is that you shoot everything. You get instant feedback. I would do six to ten assignments a day. I'd run out, shoot a picture, run back, process my film, make a print and run back out to do another assignment. If I blew it, it wasn't that big a deal. It was a good place to learn. But in the end I decided it wasn't for me and, after six months, I was bored with the work and quit.'

Satterwhite's next year was to prove even more intense. He got a job as the Governor of Florida's personal photographer. It was 1968, the year of the national elections, and Florida's governor was constantly on the move. 'We were on the road for 28 days out of 30—flying everywhere. I lived out of suitcases.'

Although this life was exciting and fun, Satterwhite soon found that he had tired of this too and decided to go freelance. He had already started to look around for a photographic agency in New York and was particularly attracted by Camera 5, as he frequently saw the agency credited. All the agencies had promised to call him if some work turned up but his expectations were not very high.

However, a week later Camera 5 called him and he began a successful five year period based in Florida contributing to such international magazines as *Time* and *Newsweek*.

Snowbound bicycle A personal picture taken during one of New York's blizzards. Hand-held shot, 1/15 sec at f/2



Throughout this period Satterwhite kept a constant eye on contemporary photography and gradually felt that he wanted to change direction completely. He developed a growing interest in the work of leading colour photographers—notably Jay Maisel, Ernst Haas and Pete Turner, who were all advertising photographers—and began to do some advertising work locally.

Then, in 1974, he decided to make a complete break and leave for California where he set up a studio and became seriously entrenched in advertising.

Satterwhite had already started to concentrate on colour photography while he was a photojournalist and his

The White Egret Taken in Florida using a 500 mm lens, and underexposed by 1-2 stops to make the water look black

advertising photography was almost exclusively colour. And he was fast developing the unique style that today is his hallmark. Increasingly, the leading advertising agencies began to call on him to work on a variety of projects from fashion to still lifes.

Satterwhite clearly enjoyed his time on the West Coast. 'LA was really a great place to live. I had a large house on the beach and the airport was right over the hill, so I could hop on a plane anytime.'

However, in the six years that he



stayed in Los Angeles only about eight of his assignments originated locally. The rest of his work was mainly from New York. 'When they didn't want to send a photographer out, they would call me.'

At the end of this period Satterwhite was doing very well, with a good reputation not just in advertising but with magazines as well. But it was becoming increasingly evident that, with all his work coming from New York, he would have to move there too.

'In the first two years I was in New York the work just never stopped. In fact, for the first three months I had an apartment, it was nothing but a floor. I was never there and didn't have the time to get any furniture.'

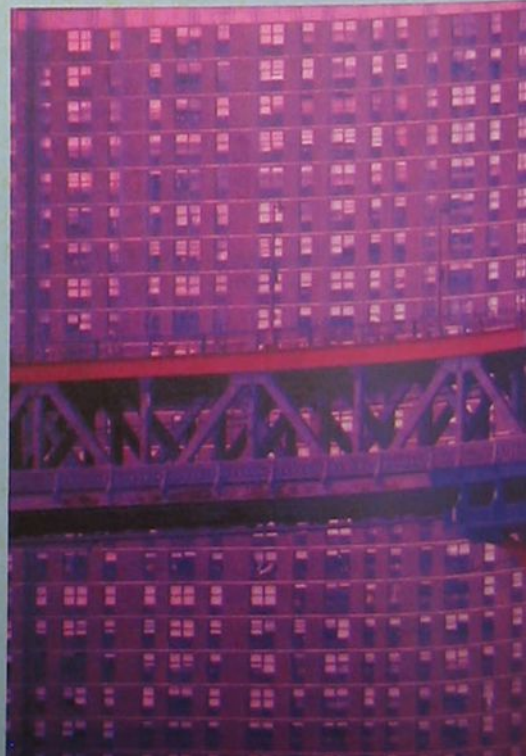
With characteristic modesty, Satterwhite attributes this immediate success to sheer good timing, but it is evident that it is due to more than that. It owed much to his graphic approach to photography. He feels that simplicity is the greatest objective in his work and likes to clean

Far horizons *On assignment in the Bahamas, Satterwhite used a red umbrella to lift an ordinary beach scene*

Manhattan bridge *Taken from the Brooklyn Bridge using a 300 mm lens and Fujichrome and then recopied on to Kodachrome 25*

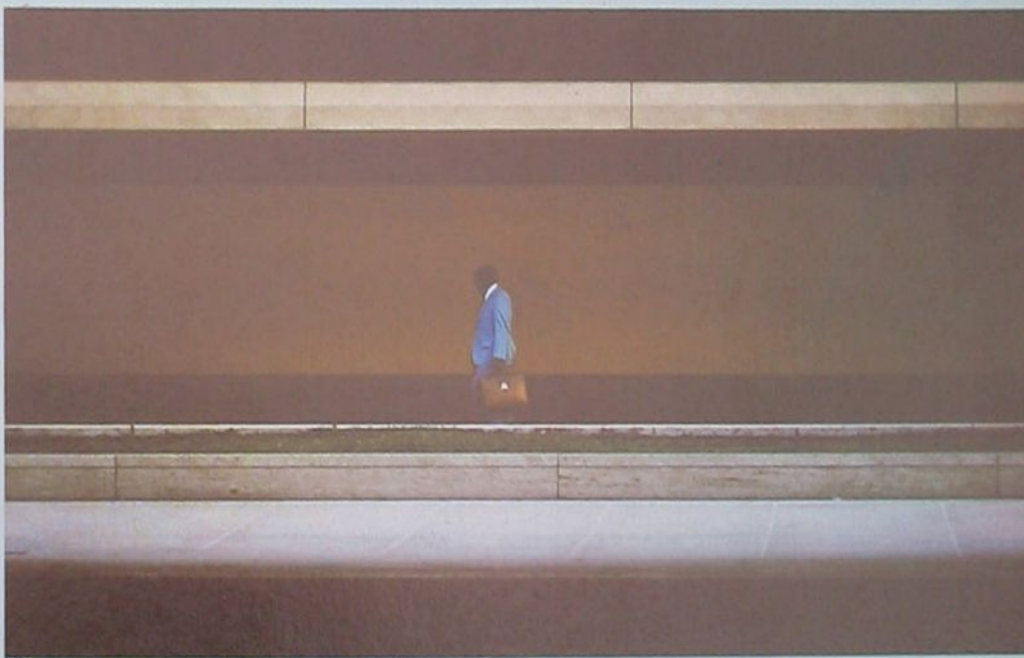
the background of as many props or natural elements as possible—he often has to work hard to convince agency art directors of the need to do this.

On commercial assignments he will use models when required but frequently prefers to use casual passers-by—either placing them in position or waiting for them to walk into a previsualized situation. This makes for more timeless images than a completely prearranged setting which is more likely to look out-of-date sooner. 'I outgrew the timeliness of photoreportage. Now I want my images to be outside of time. That way, they lend themselves to a lot of uses and a lot of different interpretations.'





Al Satterwhite



The splash Shot for 'Sport Magazine' in 1979 at a swimming competition, using 400 ASA Ektachrome at 1/500 to freeze the action

Los Angeles This businessman was shot for part of a story for 'Travel and Leisure.' Recopied Kodachrome boosts contrast

For me that makes a picture last.'

Satterwhite spends 85 per cent of his time in advance preparation—deciding on props, waiting for the right light and arranging the elements of the photograph. 'Actually taking the photograph is a small part of it. When I've finished, pushing the button is almost anticlimactic.'

With his increasingly perfectionist approach, travelling to locations is becoming more difficult. 'Nowadays, I have to have more assistants, at least one or two, because I have so much junk with me—big, heavy tripods and several cameras and lenses.'

On a commercial shoot Satterwhite

always takes at least two cases containing his Nikon cameras and lenses. One case contains only lenses, filters and meters and the other has cameras fitted with motor drives, regular bodies and Polaroid backs. 'If I want to take a long lens, like a 200 mm f/2, it will be in a separate case. Also we have cases of strobes, a case of hot lights and I usually take two or three tripod cases.'

Satterwhite owns everything from a fisheye lens to a 300 mm and generally has the fastest lens possible—most of his lenses are f/2. 'I used to have longer lenses, but I don't use them so much anymore. If I want something longer I will either use a teleconverter on the 300 mm to make it 600 mm, or I will hire or borrow a long lens from Nikon. But as I always shoot Kodachrome these are generally too slow.'

The equipment Satterwhite uses will depend on the situation and the assignment. He will use different lenses to create a sense of isolation or of



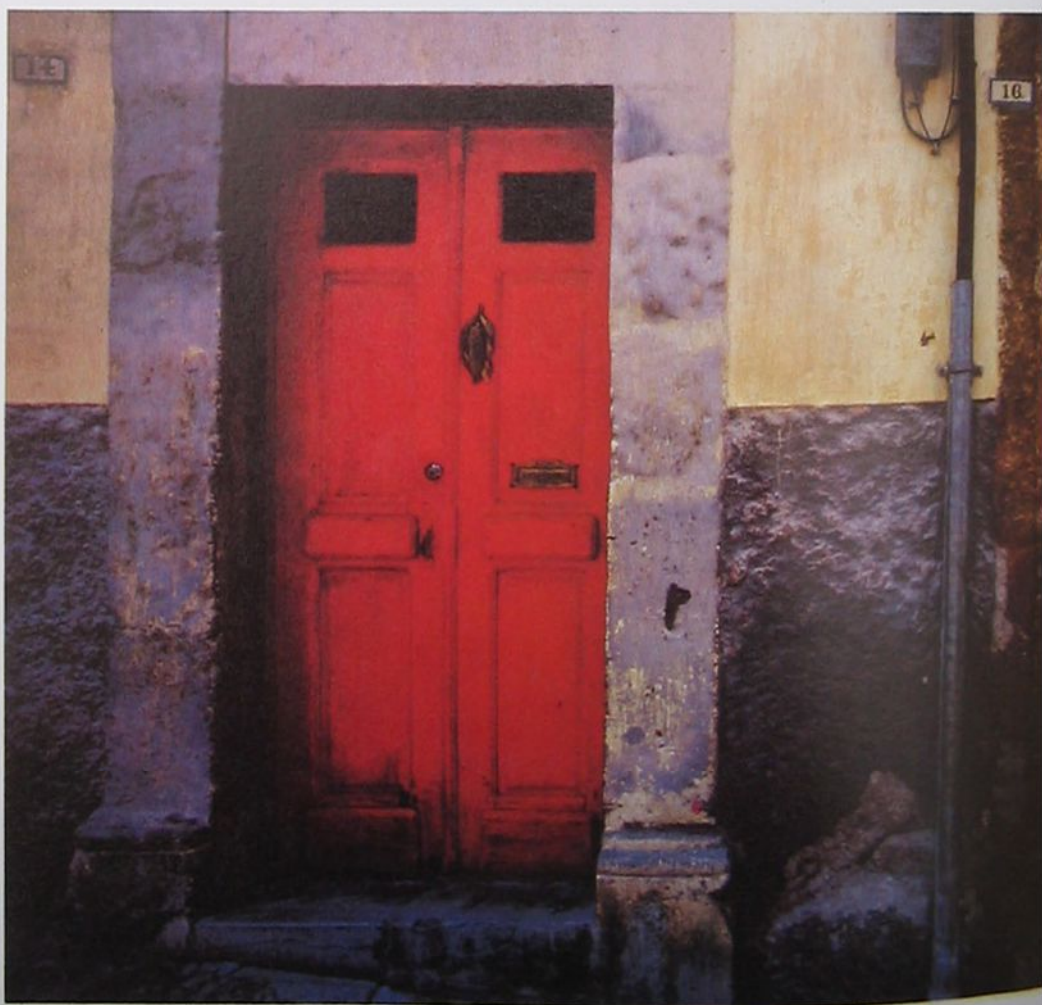
Cleaning the pool Shot at dawn using a 300 mm lens from Satterwhite's hotel balcony; and recopied on to Kodachrome

perspective, and generally shoots telephoto pictures with the aperture wide open. "That's why I have a 200 mm $f/2$. I can eliminate the background totally and just have a very shallow depth of field. If the camera is on a tripod I will try and stop down a couple of stops. But if there's movement I usually have to go for a higher speed."

On one occasion Satterwhite exceeded even his own record for not travelling light. He decided to go down to New Orleans to photograph Mardi Gras. Travelling with him were 18 cases of equipment and five assistants. He set up a studio in Bourbon Street and photographed people off the street in their extravagant costumes. The project was valueless commercially but he enjoyed it immensely and eventually had an exhibition of the best prints.

However, most of his personal work is usually done while he is already on assignment. On location he is living and working with his cameras and has more photographic opportunities. In New York too much of his time is already taken up with administration.

In running a studio a good business sense is crucial. "Even if some photographers don't want to admit it, commercial photography is a business. You have to make a profit and it has all





Gliders Taken for a slide presentation for Mazda in the late afternoon using a 300 mm lens to compress the shapes



Mexican doors Part of an assignment for 'Travel and Leisure' covering several small mountain towns in Mexico

the problems of any other business. It's scary when you're out there spending your own money.'

For him, accepting an assignment is as much a business commitment as it is a creative challenge. So to avoid the technical problems that might result in a costly reshoot, he has his equipment checked and rechecked regularly. In addition, he never commits a picture to just one camera and uses Polaroid backs to ensure that his cameras are working perfectly on location.

While maintaining a very busy commercial schedule Satterwhite also finds time occasionally to teach at photographic workshops. He finds that this helps him to think about his own work. He usually photographs instinctively, but when his students ask him how and why he has taken a particular picture, it will make him retrace his own steps.

His classes are usually orientated towards seeing graphically in colour. One of the exercises he sets his students is to illustrate how light affects film. He gets them to go out in the late afternoon and take pictures of the same subject until dark—at first, at 20 minute intervals

and then, as the sun goes down, at 10, 5 and 2 minute intervals. 'Only one student did this properly. The rest went home immediately after sunset. But on that student's film it was possible to see the blues change into warmer colours.' He will also get his students to take pictures which concentrate entirely on one or two primary colours.

For Satterwhite himself these things were learned in a long, time-consuming process. He spent many years narrowing down exactly what he liked to do. He had to get the job and then figure out how to do it, shooting and shooting until he found the best approach. 'To be a photographer you have to be totally committed. You really have to love it and be prepared to suffer for it. It would be boring for me to photograph just as a hobby. I want not only to get the picture but I want it to mean something. I want to get it published.'

Recently this attitude has also led him in to the fine art market. He already collects work by other photographers, purely for his own pleasure, and considers it the ultimate satisfaction to have his own work purchased. Although getting established as a fine art photographer is a long process, he enjoys this further challenge to his photographic career. In the long search to create photographs to satisfy his own exacting standards, rising to such challenges has always provided him with his best stimuli.

Camera design

A modern camera is a highly sophisticated piece of engineering. But as it must be made to look and feel right camera design is as much an art as a craft. So, just what goes into it?



sales by retaining knob wind and non instant-return mirrors long after the Japanese had moved on. Furthermore, if a manufacturer is clearly identified with a particular type of camera—such as Leica with rangefinders or Rolleiflex with twin lens reflex cameras—people may not take their other products seriously. There is still a feeling that only the rangefinder is a 'real' Leica.

Fashion, also, is something the designer ignores at his peril. In the 1930s, chrome cameras cost more than the standard black lacquered finish and was favoured both for its durability and modern look. In the 1960s and 1970s, the position reversed: black became far more popular.

Increasingly, styling has become a major factor for design consideration. Sometimes, improved styling does actually make the camera easier to use, but the aim is usually just to make the camera more attractive. This can be

Modern cameras and lenses are highly sophisticated pieces of equipment, involving precision engineering of a wide variety of materials. To achieve the high quality photographers have come to expect, they must be designed to meet exacting specifications. But for the manufacturer, even the highest quality camera is useless if it does not sell. And camera design involves a careful balance between many factors.

When a new camera is to be designed, the manufacturer usually has a good idea of the kind of market it will be aimed at—whether at the cheap 'snapshot' field or the professional. But before the designer can get down to work, the company must get a very clear idea of just what will sell. One way to assess this is to prepare *user profiles*. These indicate what sort of people will buy the camera, what they will use it for and what they are prepared to pay for it. Also, it is surprising that people do not necessarily buy what they ask for. For example, an

Highly prized and highly priced, the current Leica MP4 is regarded by many as the ultimate 35 mm camera, the perfect combination of usability, traditional craftsmanship and modern technology

oft-repeated request is for interchangeable backs on 35 mm cameras, but those firms that have introduced them (including Adox, Kodak, Mamiya, and Zeiss) have all dropped them again because of poor sales.

There are also many non-engineering factors a designer needs to bear in mind at the concept stage. Among them is tradition, or customer expectation. A surprisingly important consideration, for instance, is what the customer has come to expect. If a camera is too unconventional, either in appearance or in operation, few people will buy it, as Voigtlander found to their cost in the 1950s. On the other hand, if it is too old-fashioned, it will similarly fail to sell. Once again German manufacturers lost



important in a market where many cameras have similar specifications.

Tradition and ergonomics

Once the marketing decisions have been taken, there are three constraints with which the camera designer must contend. The first is the ergonomics of the camera—the need to get everything into a convenient package, with easily operated controls. The second is the engineering requirement—how to build a mechanism that works, works well, and keeps on working. The third (and often overriding) consideration is cost.

To a certain extent, an engineer builds on what has been done before. Cameras are almost never designed from scratch. Usually, they are built around an existing film format, and employ either existing components or a modification of them. This governs much of the design of a new camera, and much of the remaining impetus may come from the need to improve on the old model.

Nevertheless, there are original

Kodak Ektra Built in 1941, this was the first attempt at a 35 mm camera with an interchangeable magazine back. Although technically sound, the camera was uneconomical to produce in small numbers

A modern classic The current Hasselblad 500CM is still basically the same as the original 500C of 1957. Most modern Hasselblad accessories will still fit even their earliest models



Colin Gifford/camera courtesy of Vintage Cameras Ltd.

designs every now and then—such as Hasselblad's 1600F of 1948, incorporating only one existing system, 120 roll film. But even then, the concept of the focal plane shutter was not new, and it is widely known that Victor Hasselblad learned much about how *not* to do things from the Primaflex. In 1957, he incorporated another existing component, the Compur shutter, to produce the Hasselblad 500C.

Once the Hasselblad had shown the way, other manufacturers produced variations on the same theme. The roll film SLRs from Rollei, Bronica and Mamiya each have their own specific advantages, and are fine cameras, but they do not display any marked departure in concept from the original Hasselblad idea.

Similarly all modern 35 mm SLRs are recognizably the same as the 1948 Contax S—except for the Rollei SL2000, which is arguably a miniature Hasselblad. But though the basic concept is the same, there have been many detail improvements, from new wind-on levers to the drastic shrinking of the SLR initiated by the Olympus OM-1 to make it lighter, handier, and of wider popular appeal.

It is difficult to determine just how much of the design of a modern camera is determined by ergonomics, and how much by tradition. The lever wind, for example, is almost universally stan-

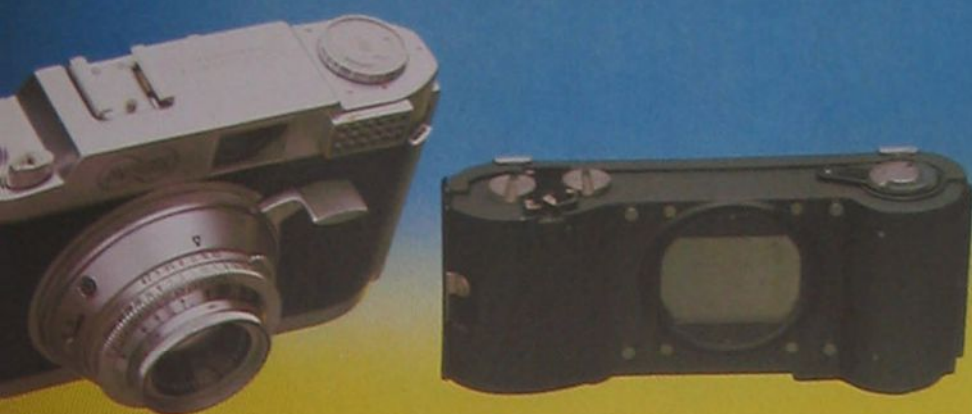
dardized. But there are alternatives. Those who have tried the baseplate trigger-wind invented by Leitz, for instance, and also used by Canon, believe it is better than lever wind.

Others have grown to love (or at least tolerate) alternative lever positions on cameras such as the Alpa, the Retina, the original 35 mm Ektra, the Exakta and many others. Similar examples could be found for the release button, the rewind clutch, the shutter speed dial, and just about every other control on the camera.

Certainly, some locations and modes of operation are much more convenient than others. Most levers, for example, are better than most knob winds. Sometimes the most unusual designs can, once initial prejudices have been overcome, prove more than satisfactory. The Hasselblad, for instance, seems at first very awkward to handle, with all the controls in the wrong places. But with a little practice, and the Hasselblad-approved left-handed grip, it is suddenly transformed into one of the best-handling cameras of all time.

It is certain that what pleases one person will not necessarily please another, and so there can never be any single 'best' cameras. To the designer, this means that there is still plenty of scope for originality: for the prospective buyer, it means that you should always try out any camera before parting with your money.





Adox 300 This more recent design for an interchangeable magazine 35 mm camera was based on a Leitz patent and used a trigger type film advance-shutter wind-on. Sadly, it was never developed fully

Inside the Canon AE-1 With sales topping 6 million, the AE-1 is the world's most popular automatic SLR. It is also one of the few to feature shutter priority as opposed to aperture priority

metal, but the principle is true for all cameras. For example, a professional Nikon F3 employs a stainless steel lens mount for maximum wear resistance, whereas a cheaper camera might use plated brass.

Quality reduction becomes unacceptable when the camera is incapable of fulfilling its purpose, at least for long.

Cost-saving by intelligent design is more complicated. A simple example might be the almost universal adoption of die-cast light-alloy camera chassis. This is an excellent engineering solution, because they are strong, rigid, and light. They are also economical because they can be made quickly and cheaply by machine, instead of requiring long hours of expensive labour-intensive work by skilled men.

Perhaps the most widespread example of cost-saving design is the ever-increasing use of electronics in cameras. An electronic shutter is more accurate than the mechanical types it replaces, and can be linked easily to the camera's metering system. Moreover, a flexible mat with all of the logic circuitry, and almost all of the wiring, can be mass-produced at low cost and inserted into the camera as a unit. The only drawbacks are the electro-mechanical interfaces, which require extreme care and clean-

Colin Gifford

Design and engineering

Cameras are precision instruments, and to work well the design must allow them to be manufactured to very fine tolerances. For example, to keep the film in the precise plane of focus, the lens-to-film distance at $f/2$ in a 35 mm camera should not even vary as much as the thickness of a human hair.

Similarly, the evenness of exposure across the frame depends upon the width of the slit in the focal plane shutter as it travels in front of the film during exposure. This evenness may not seem too difficult to achieve until you realize that, to compensate for the acceleration of the blinds as they cross the focal plane, the slit width must be increased gradually during travel.

A less apparent problem arises from the differing exit pupils of interchangeable lenses. Variations in the exit pupil at the rear of the lens means that the light falling on the film may vary even if the aperture stays the same. A TTL meter, if fitted, must be able to handle this as well as the effects of interchangeable screens.

It is important to remember that it is not enough to simply achieve these tolerances once. They must be repeatable, millions of times—indeed for as long as the camera is designed to last and under all kinds of rough handling.

The need for robustness combined with precision is evident in the interchangeable backs of roll film SLRs. They must be able to withstand being changed

quickly (perhaps clumsily) and be sufficiently rugged that a small amount of dirt does not affect their operation. But there are several linkages between the camera body and the back: these are expensive to make and potentially vulnerable. Most importantly, it must be light-tight.

Even when the back is in place, the join is a possible entry point for rain and dirt, as well as light. Moreover, 'idiot proofing' may be needed, so that the photographer cannot take pictures with the darkslide in place, remove the magazine with the darkslide removed or even make double or black exposures.

The same constraints are true for interchangeable screens, lenses, viewfinders, and even film-loading systems. Not surprisingly, one of the easiest ways of saving cost is to minimize on such features. Unfortunately, purchasers do not always appreciate this, and it may be easier to sell a poorly made camera with apparently impressive specifications than to sell a much better but more basic model.

Essentially, the cost of making a camera can be reduced by any combination of three things: reduced quality, intelligent design and efficient assembly and construction. Quality can be reduced acceptably by specifying less expensive and exotic materials, for instance. One example is the use of gold-plated flash contacts instead of solid gold-iridium alloy. Naturally, only the finest cameras would specify the solid





© Marshall Cavendish/camera courtesy of Canon

liness in assembly and careful protection from dust and corrosion in use, and the difficulty of repair. A repairer can no longer spot faults by eye, as he could on a mechanical system, and he may have to replace all or part of the electronics instead of simply cleaning out the dirt which causes most mechanical shutter defects.

Cost-saving during assembly requires that the camera be designed to make the best use of specific assembly procedures. Essentially, there are three approaches, though these may be combined to various extents. They are assembly by skilled labour, assembly by unskilled labour on a production-line basis and automated production. In designing the camera, the designer should bear in mind which approach is to be used, and attempt to get the best out of that approach though his choice will depend too on whether he is designing a camera for the professional or the specialist, or for the snapshot market.

Voigtlander Vitessa, Known as the bomb doors model, had an unusual wind-on, a giant 'shutter release' on the top and focusing by a thumbwheel on the back plate

Pure decoration The red stripe on the Nikon F3 has no practical function at all, but it does help the F3 to stand out from other black SLRs on the camera shop shelves



Colin Gianfield



Colin Gianfield/camera courtesy of Vintage Cameras Ltd.

Improve your technique

Putting together a portfolio

If your pictures are good enough, you might want to try to sell them, either directly to clients or through an agency. But first you must make up a well prepared and presented portfolio



If you want to sell your pictures to magazines or agencies, or simply show them to a friend, it is important to present them properly. Rummaging through a boxful of prints or transparencies is neither impressive nor very effective. So the best idea is to put together a selection of work as a portfolio.

A good portfolio is essential when you are trying to get work as a photographer, or trying to sell pictures (see page 1947). So this article deals with how to put together a professional quality folio. But even if you only ever show the work to friends, using a professional approach helps to give direction and a touch of class to the presentation.

Choosing the pictures

The first thing you have to decide is which pictures to include. A random selection of your favourite shots might appeal to you, but to someone else such a collection often looks jumbled and meaningless. If you are using your portfolio to sell work, you are not simply trying to dazzle people with the technical and aesthetic virtuosity of your work. The idea is to give some idea of what you are interested in and how you approach certain subjects. And in a 'working folio', which is designed to persuade people that you are capable of handling an assignment, you need to show that you have experience of a range of problems and know how to overcome them.

It may seem obvious, but all the pictures should be top quality. However good the idea of the picture might be, if there are any technical faults the picture must not be included. Some faults, such as camera shake and wrong exposure, are easy for you (and others) to spot. But there can be more subtle problems. For example, in a fashion shot the garments might not be sufficiently well lit to give the right amount of detail. Look closely at each picture and see if there is any simple way in which the shot could have been improved. If there is, leave it out.

It is best to edit down to the very best shots, and try to group the pictures around various themes or subjects. A general folio, for example, could have sections on portraits, still lifes, landscapes, and so on. An editorial folio could have sections on demonstrations, travel shots (grouped by country), candid street shots and special events (grouped separately). The types of division you use are up to you, and should be designed to suit the nature of your work. But make sure the groupings are logical and obvious so that the viewer can understand them without being told.

If you have had any work published, include it in the folio, but only if it is good. Poor published pictures next to good personal shots suggest that you cannot work to an assignment. Any substandard work is also boring to look at.

Suitcase folio This sturdy type of folio will carry a large number of prints and transparencies. It is worth including some business cards to leave with the agency



Fashion photographer Sandra Lousada To show that she can handle different types of fashion assignments, Sandra Lousada's portfolio shows a variety of fashion styles and a variety of photographic problems: hard theatrical lighting for a leather jump-suit, more

delicate lighting and a romantic setting for a softer fashion style, plus the technically difficult shot of a face in a mirror. The changes in scale of the photographs from close-up to full figure add further variety and interest to the portfolio

Once you have brought all the pictures together, look at them again to see if they really represent the sort of work you do. At this point the number of shots can be quite high—editing them down to the final folio comes later when you decide how to present them.

Presentation

At this stage you will probably have a confused assortment of slides and prints of various sizes, which somehow have to be made into a coherent folio. So the next job is to decide what form the folio is to be presented in.

The exact nature of the folio depends on what you are using it for. If you intend selling pictures to a magazine, for example, then they will most likely want to see original colour transparencies or black and white prints which they can keep for a while. But for showing to friends, and as a way of introducing your work (and yourself) to people, mounted prints in colour and black and white are more appropriate.

This usually means making prints from the most important transparencies. Large prints (36 x 28 cm, for example) are most effective if the technical quality of the work is good enough to stand this degree of enlargement. Bigger prints, however, should be avoided as they are difficult to look at when held at relatively close distances. Print quality is very important, so it is worth spending time or money on getting top quality prints made—quality is far more important than

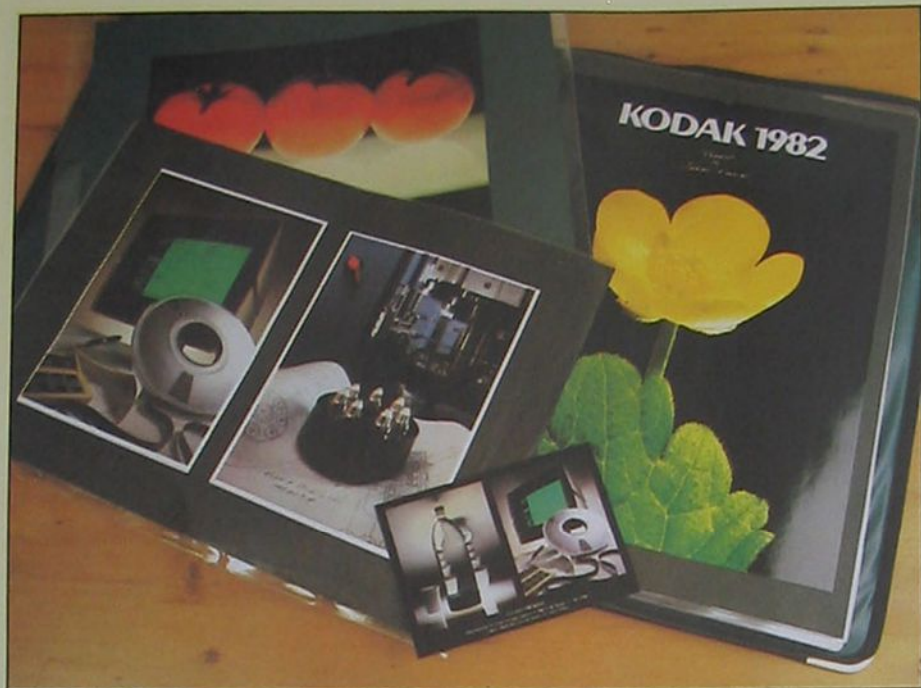
quantity in a portfolio.

The best solution to the problem of aiming at different markets is to have a large range of both prints and transparencies from which you can make the right selection for each occasion. For this reason you should never have more than one print mounted on a piece of card, as this limits the flexibility of the folio.

For a sophisticated presentation and maximum protection you should have individual prints and tear sheets laminated. This involves sealing them inside plastic (a subsequent article on



Trimmed and laminated These prints, all made to the same size and carried in a smart case, make an effective presentation. Lamination protects the print surface



Advertising and industrial work Julian Nieman's portfolio prominently features work commissioned by Kodak. Including photographs taken for a prestigious name always makes an impression, but anything carrying a date has a limited portfolio life. Old work

should be regularly replaced. Nieman shows his versatility by including a simple but striking still life together with more complicated set-ups. The image on the business card acts as a reminder to a client of the photographer's ability and personal style

advanced finishing techniques deals with this in greater detail). A number of processing laboratories offer this service. If you make prints from slides, intending to laminate them, do not use the plastic coated Cibachrome material (resin-coated paper is fine). This is because the lamination process involves heat which can melt the plastic. If the prints are to be mounted, you should use dry mounting methods.

When the laminated prints are placed together in the folio they tend to rub against each other, and if there is any grit



Ring binder and plastic sleeves Folios of this type are a useful alternative to lamination. The case also has a pocket for loose prints and published work

present their surfaces soon become very scratched and tatty. So it is a good idea to fix a few pieces of velvet to the back of each print, using glue or double-sided adhesive tape, to prevent this happening.

Prints can be laminated on their own or after being mounted on to card. Mounting on to card is usually better as, by using the same size and colour of card, the folio looks far neater and more professional than a collection of prints of various shapes and sizes. It is also a good idea to keep all the mounts the same way up for viewing. For example, you could use rectangular mounts, all of which are horizontal ('landscape' format) when viewed. The result is that when people look through your work, they do not have to keep turning prints round.

If you find that lamination is too expensive (a single sheet often costs as much as a roll of Kodachrome), there are a few cheaper alternatives. You can, for example, simply dry mount large prints on to thick card. These eventually become dog-eared and dirty, but look impressive in the short term.

You can also put prints into plastic sleeves. Many of these are designed to be clipped into ring-binder folio cases, to make a loose-leaf book. It is possible to buy books which contain permanently



Reportage A press photographer is often pigeon-holed by agencies as only being suitable for one kind of story, so Mike Abrahams of Network has included a wide variety of assignments in his folio. There are 'hard news' shots of headline stories and photographs of prominent

politicians, pictures that are in constant demand by newspapers and magazines. But there are documentary pictures too, and though working mainly on location, the shot of the theatrical group shows that he is also at home in the controlled environment of a studio



Adam Woolfitt As an editorial photographer specializing in travel, Adam Woolfitt has had his work published in magazines throughout the world, and since for him the work of the

photographer is not complete until the picture appears on the printed page he has included a number of sample spreads, cut from the publications and mounted (tear sheets). This not only

shows the range of subjects and situations he has photographed, it also shows new clients the way in which previous magazines and their editors have used his work

bound plastic sleeves. These are available in A4 and A3 sizes, and are useful for presenting complete photographic projects, but are not very impressive as folios.

Transparencies should be presented in identical mounts too. The best type is the black card mount which takes twenty 35 mm, twelve 6 x 6 cm or four 5 x 4 inch transparencies (see page 1405). This type has slots into which the transparencies slide, and has a plastic cover in which the entire mount is placed to keep everything clean.

You do not have to fill the whole mount with pictures. An array of 20 pictures can be confusing and intimidating to the viewer. It is often better to use, say, 12 pictures, and fill the remaining gaps with black card. This may mean using one or two extra mounts than strictly necessary.

Try putting a variety of transparency sizes into the mount—a mass of 35 mm

slides is difficult to look at and that you have to use a lightbox and magnifier. If you only shoot on 35 mm, select some of the best pictures and have them duped up to 6 x 9 cm, or 5 x 4 in.

Arranging and using

For the sake of variety and interest you should include both prints and transparencies of various sizes in the folio. But do not be tempted to cram in everything, in the hope that your victim will find something of interest.

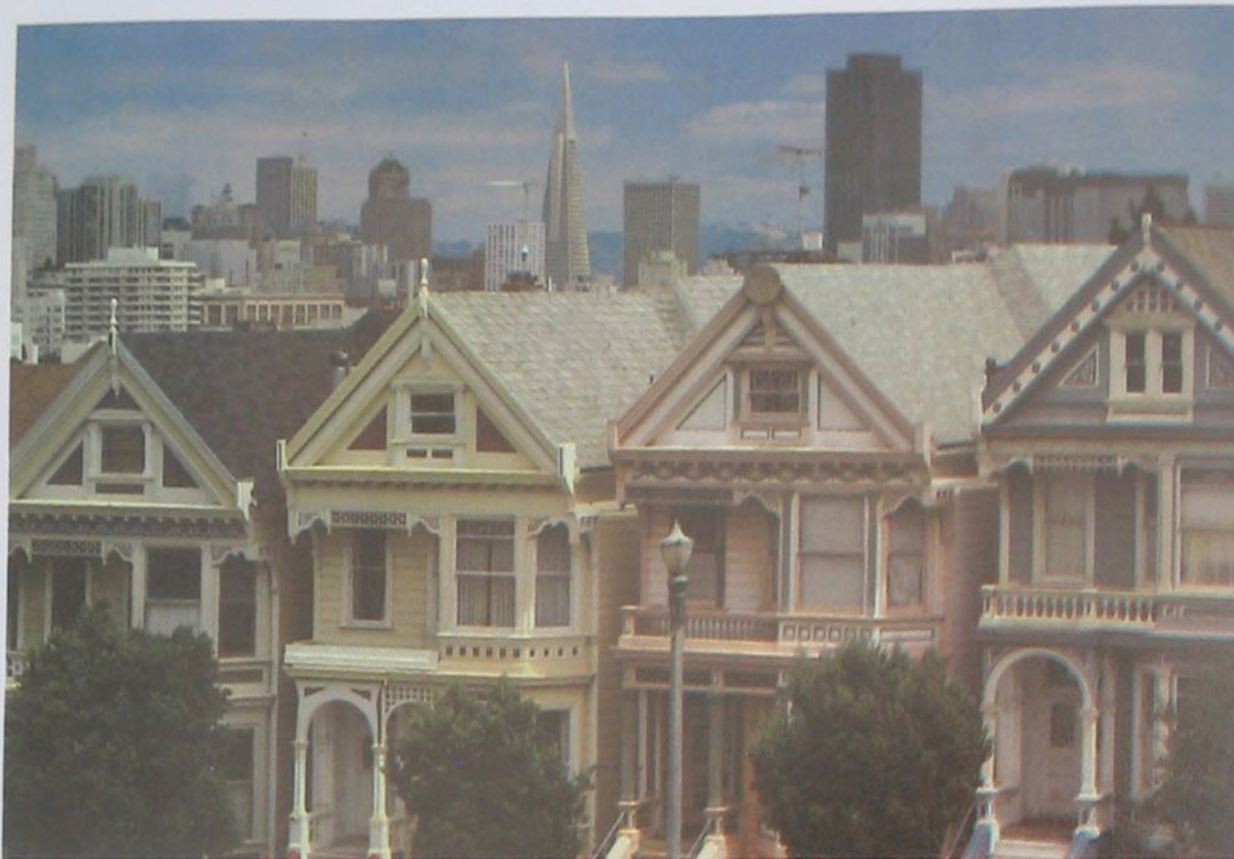
Remember to keep the folio up to date. This is particularly important if your work is biased towards reportage—photographs of an event which happened five years ago suggests that you have not been doing much since. Old pictures of this sort should only be kept if they are very good, and display your photographic ability as well as news content.

It is a good idea to mark prints and transparencies with your name, address and telephone number. But do this on the back. Seeing your name time and time again becomes very tedious for the person looking at the work. Generally the presentation should be as neat and simple as possible. If you have separate mounted or laminated prints and sheets of transparencies, keep them together in a portfolio case.

The best type of case is like an overgrown briefcase, which is strong and easy to use. But these are expensive and there are many alternatives. The types to avoid are the folders made of card which use tied laces of ribbons to hold them together. The laces inevitably become solidly knotted at the wrong moment, and the folders soon look tatty. Whatever case you use, it should always look clean and smart—careful presentation implies pride and care in your work.

San Francisco

Through the lenses of photographer Sergio Dorantes, San Francisco shows itself to be one of the most pleasant cities of the United States. But the approach to this assignment could be taken almost anywhere



Unlike most other cities in the United States, San Francisco retains a reputation for its picturesque charms and the warmth extended to its visitors. The attractions of the city and the general area are numerous—the rugged north California coastline, the famous Golden Gate Bridge, the hilly city streets and the cable cars are just a few of the attractions of interest to a photographer.

Continuing his tour of the American West, Sergio Dorantes stayed in San Francisco for a few days in order to take photographs that would communicate the character of the place. However, since there was so much to photograph and since the city is full of hilly roads, Sergio knew that careful planning was essential in order to decide on the shots he was going to take and the best view-points for them. Illustrated books, maps and even postcards all helped him to get a good idea of what to expect before he actually arrived. Having worked out what to photograph and roughly where to do it, Sergio devised a plan that enabled him to cover the various locations during the best hours of daylight—early morning and late afternoon. An organized shooting schedule also allowed him to make best use of his limited stay in the San Francisco area.

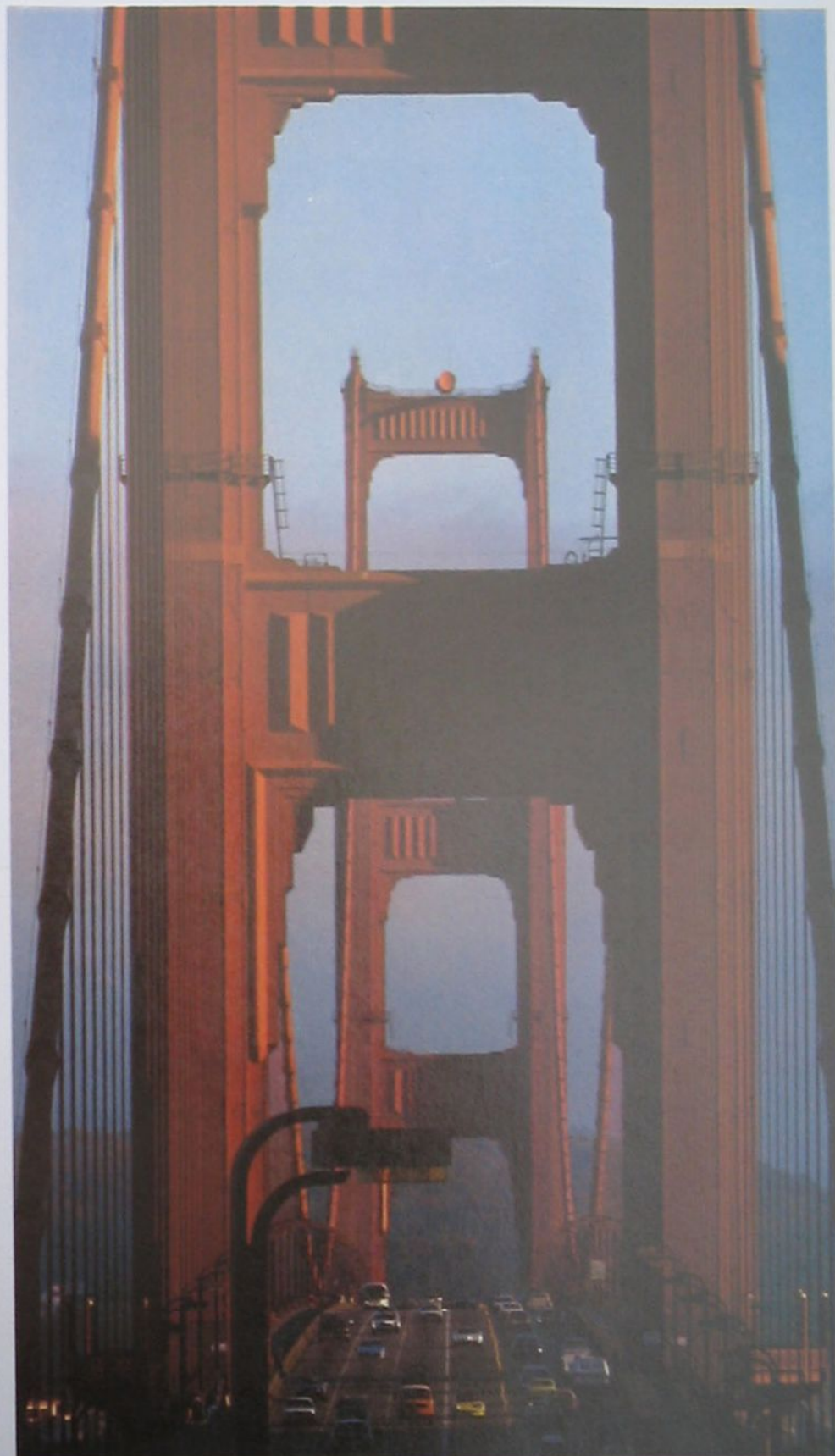


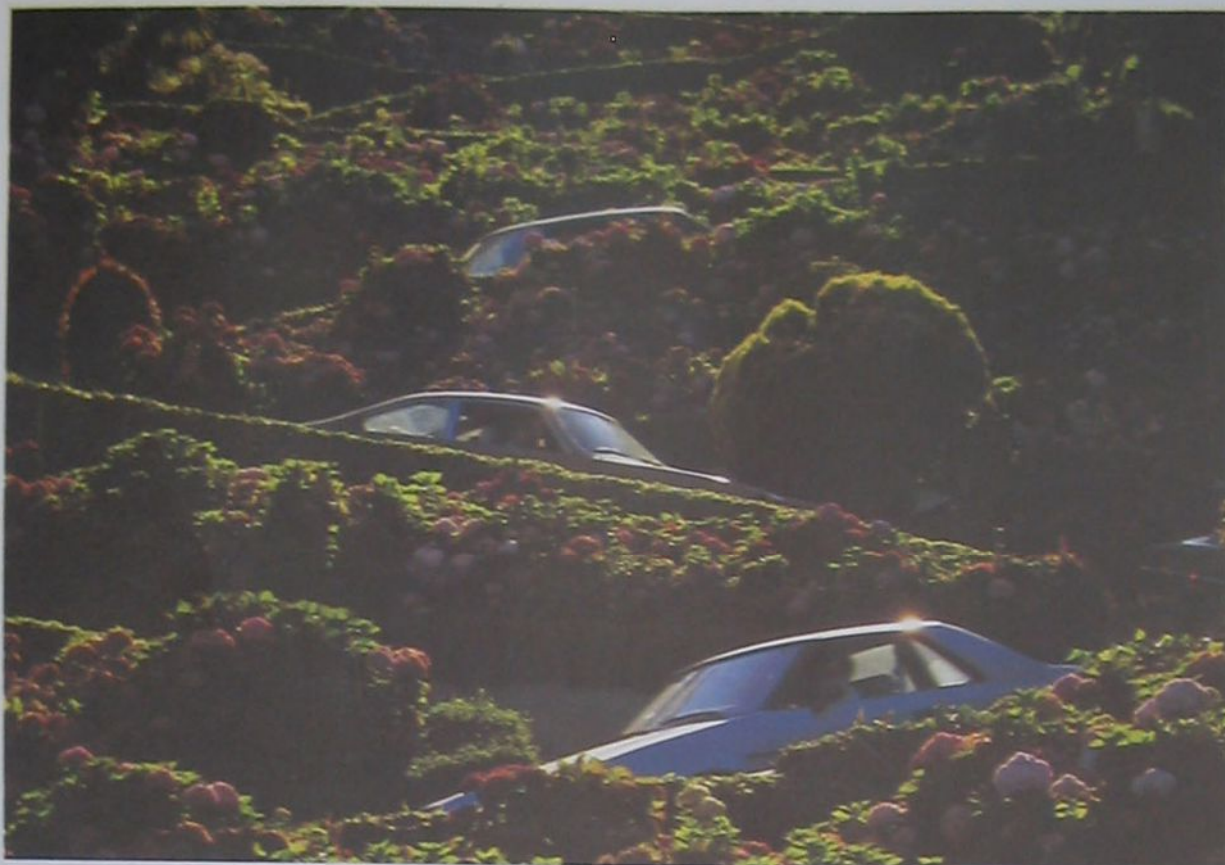


Row of houses This is a well known view of the city but to make the most of it Sergio used his 80-200 mm zoom which allowed him to crop out unwanted details—like the cars parked in front of the houses. The lens also allowed a clear view of the background. **Uphill tracks** The low angle of the late afternoon light invested this almost monochrome scene with atmosphere

Looking up For a more unusual shot of San Francisco's banking area, Sergio fitted his 20 mm lens and featured a group of leaves in the top half of the frame. By stopping his lens down to f/16, the whole scene was kept in focus.

Golden Gate Bridge The telephoto perspective and magnifying power of a 500 mm mirror lens created a dramatic view of the famous bridge





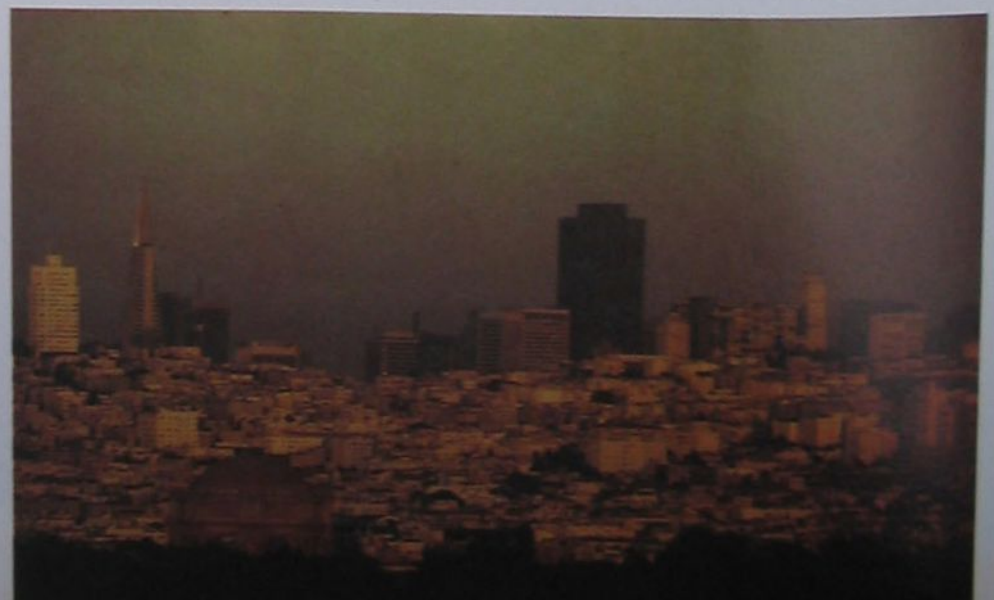
Zigzag road This is another famous part of San Francisco, but Sergio used the late afternoon light to backlight the scene and to bring out the full texture and colour of the bushes lining the road

Coloured houses One part of the city contains row after row of painted houses. Here a 300 mm lens was able to isolate a group of these buildings and to organize them into a straight pattern

Distant view To get a good long shot which included most of the city centre, Sergio waited until early evening when the warm light struck the buildings and the artificial lights showed up well

The shot of the tramcar tracks receding up a steep hill is an example of how Sergio arranged his day so that he was in the right place to get his shot—just as the afternoon sunlight filtered through the buildings and made the rails shine brilliantly. Similarly, Sergio made sure that his shot of the Golden Gate Bridge could be done using the last rays of sunlight so he could enhance the warm colour of the paintwork. Having arrived at a location, Sergio often waits around until the light changes to suit the subject. This can often make the difference between an average shot and a striking one.

To help him find the variety of images he always likes to get from a place, Sergio put up with the discomfort of lugging around a camera bag filled with Kodachrome and lenses—from a 16 mm fisheye to a 500 mm mirror lens. The long telephotos used for photographs like the one of the bridge give a view which is impossible to achieve any other way—the only problem is that shots like this that are taken in low light have to be taken using a tripod and this increases the load on a photographer still further. Sergio added, 'Shots like the one of the bridge may look easy but they can pose problems. I used the 500 mm mirror lens for this and, since it has a fixed aperture of $f/8$, the Kodachrome 25 film I was using called for a shutter speed of $1/15$ second. Even using a good tripod, a cable release and my Nikon F2's mirror lock, I still knew that there could be camera movement during the exposure that would make the image look soft. I just had to be as careful as possible, taking several shots of the same thing, to ensure that one was successful.'



What went wrong?

Textures

Photographers are often attracted by the textures found in everyday life. Such pictures involve aesthetic as well as technical problems—Colin Molyneux gives his comments on four 'texture' shots



These antique books make a very good study in texture but there are two points which would have helped make the picture more effective. First, it would have been better if the photographer had filled the frame completely with the subject and not left the black space on the left which tends to unbalance the composition. Second, the strong directional light has created bright highlights and harsh shadows which have in fact detracted from the texture and tooling of the leather. To bring out the surface texture of a subject the light needs to be directional, but it is often more effective if softened by tracing paper or bounced off a reflector. This reduces the contrast and allows the subtleties of the texture to show more clearly



This picture is a good example of a texture subject well seen and photographed. The light catching the ribs and edge of the leaf throwing all the details into sharp relief is particularly good. There are only two suggestions I could make which would make this shot even more of a winner. A piece of black card used as a background would clean up the left edge of the picture. This would also make the edge of the leaf stand out even more. Moving in a little closer just enough to exclude the light green stem at the top right of the frame, would remove a distracting element. It's worth remembering to check all the edges of the frame before tripping the shutter



I can see what attracted the photographer to this subject but I don't think he or she spent enough time thinking about it before taking the picture. The surroundings contribute little, if anything, to the shot and as the detail in the wood is the most interesting aspect of this subject it would have been much better to have moved the piece of bark to a more neutral background and to have moved in closer making sure that no part of the subject ran out of the frame. This would have concentrated attention on the patterns in the wood. A directional but softer light source, softening the shadows and making them less obtrusive, would have improved this picture considerably, bringing out the texture better



I like the contrast in colour and texture between the feather and the background of leaves in this picture, but I think a closer viewpoint would have helped give a little more emphasis to the feather. As it is, the composition would have benefited from moving the feather more off centre, thus giving the eye a chance to wander over the leaves. At present the eye is drawn straight to the centre of the frame and isn't encouraged to take in the textures.

There is a technical problem as well—not everything is sharp. With pictures like this depth of field is crucial. I would have used a more square on angle, thus making sure that whatever the *f*-stop used the picture would be sharp from top to bottom of the frame. It's the detail which is important in this type of photograph, and it needs to be sharp all over the frame to be effective



Darkroom aids

Low cost and easily made labour-saving devices deserve a place in your darkroom. Although you have to consider the choice of more expensive items more carefully, these too can prove extremely useful

While a collection of little used accessories does little but clutter up the already restricted space of the average darkroom, there are many 'non-essential' darkroom accessories and devices which can prove immensely useful in day to day work. Many of these items cost next to nothing to manufacture yourself, and are simple to make. Others can be bought cheaply. Even the expensive accessories need not be entirely disregarded as their use—and cost—can be shared by a group of enthusiasts.

Printing accessories

The biggest choice of accessories is undoubtedly directed towards the printing side of darkroom operations. Many of the main items have already been discussed—such as meters (pages 1136 to 1139), analyzers (pages 1718 to 1721), washing and drying equipment (pages 2058 to 2060) and finishing equipment (pages 1453 to 1455).

Although a good quality purpose built

masking easel is an indispensable and frequently used accessory, occasionally it is nice to be able to make prints with no borders. You can, of course, simply trim off the excess from a print with a border. And, in the case of RC paper which does not have a significant curl, you can simply place the paper where you like on the enlarger's baseboard.

But you have to use a special easel in other situations—such as when you are making full area large size prints on fibre-based paper which, for some reason has to be printed vertically. If some trimming is possible you can use a pin board. With a suitable sheet metal backing, the paper could be held in place using several magnets. Alternatively, plastic or wood sheet can be sprayed with adhesive to give a tacky surface on which prints may be positioned to correspond with the edges of the paper or film it is to hold.

Also useful are variable format masks which enable you to print either one, two

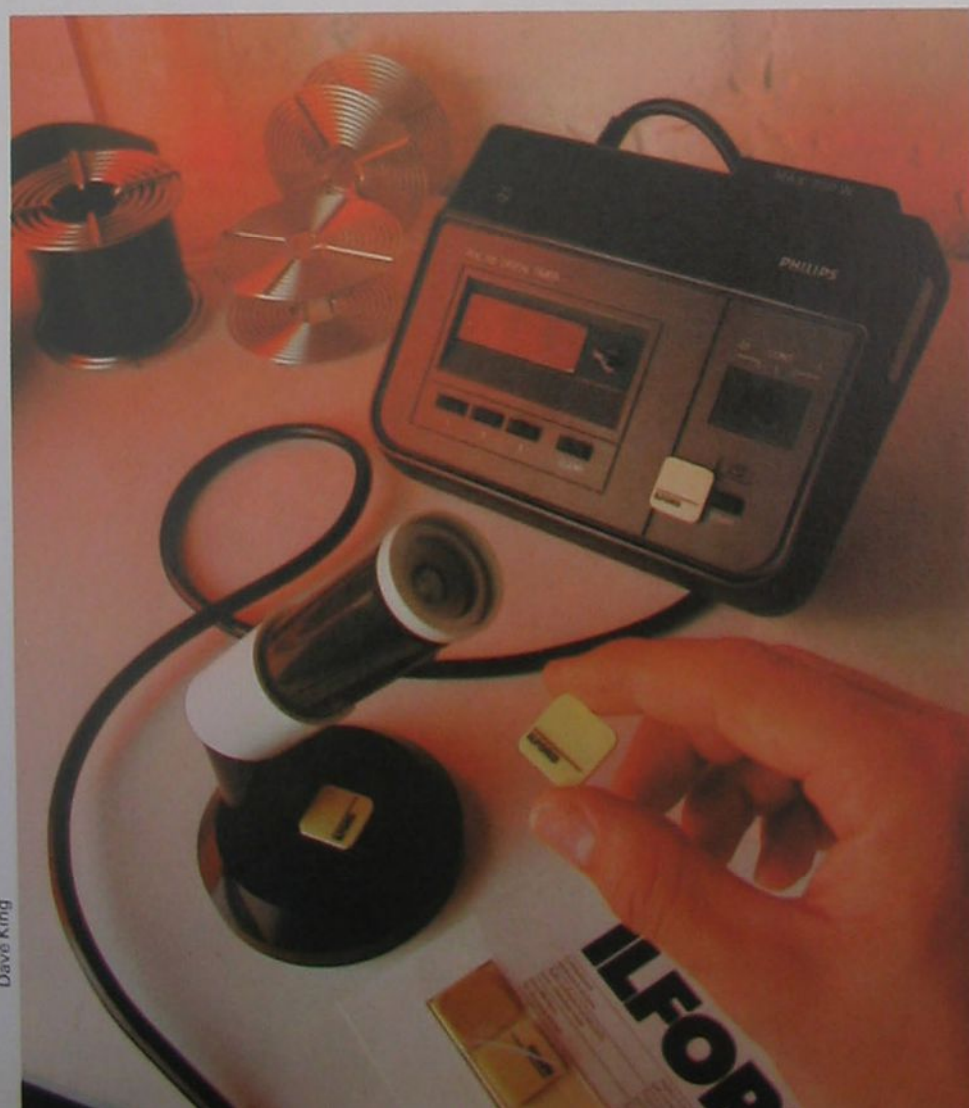


Luminous notepad An extremely useful low cost accessory for making notes in safelighting or in darkness—ideal for filtration notes in colour printing

Find that switch These little luminous stickers can be stuck on or near switches, printing aids and darkroom accessories to help you find them in darkness

or four images on each sheet of paper by judicious juggling of the removable mask portions. These are available from several manufacturers, but you can easily make your own from wood or plastic sheet. The design shown enables you to print up to four images on a single sheet of paper, but is tailored to suit a single size of printing paper.

Dark borders, especially those restricted in size to a thin 'key line' around the very edge of the print image area, look particularly attractive. These are normally produced by giving the print a second exposure, this time to white light, after the main one. A mask, cut slightly smaller than the main image area, has to be accurately positioned within the mask blades to ensure that the eventual border is even. This mask can be cut from card or, better still, from more durable plastic, in several commonly used print formats. The blades of the masking easel can be adjusted to give borders of different widths, and small spacers, such as matchsticks, may help





Fault finder Pre-exposed quality control strips of film and paper can be bought to test your processing routines very accurately. These can help you to isolate the causes of, for example, a persistent processing cast

you to get an even border all round.

Yet another way of printing a border is to place a lith film 'negative' in contact with the print prior to the final exposure to white light. Clear rules on the lith negative allow light to pass through, so printing black on the print. The lith contact film should be properly spotted, and weighed down by clean glass during the exposure. The method can be elaborated in order to add the photographer's name, for example, and the final negative lith image can be produced either by camera copy from artwork or by direct contact from translucent original artwork.

Cutting test strips in the dark can be awkward and tiresome, so for efficiency you might like to make your own wood-slot test strip cutter. All you need is a sheet of suitable wood with a channel cut into the surface. Line the channel with some metal strip and provide a paper stop on one side, several centimetres from the cutting groove to give a strip of the desired width. To use it, just lay a sheet of unexposed paper on top and you can cut test strips by running a knife down the channel.

This is much more economical than buying a paper trimmer but if you already have one then you could tape some card on the board a little way back from the blade, and butt the paper to be cut against the card. In this way you can produce test strips of consistent size quickly and easily. Take care when using the guillotine type of trimmer in the dim lighting of a darkroom.

Alternatively, a non slip alloy ruler with rubber underneath could be used with a knife and cutting mat to chop strips for tests. But a test strip printer with slats that reduces the number of times you need to cut paper is a better idea.

Instead of using separate strips for each test, or covering part of a small strip with card as exposure progresses, just cut your sheets and, for exposure, flip the slats over one at a time at your chosen intervals. The removable slats give more reliable results than using card to cover the test areas. You could also use this accessory with film when, for example, making tone separations or other derivations and need to make tests.

To help you estimate exposure differences with magnification changes, and reciprocity factors for different apertures and filters you may wish to use, you will find a plastic dial or a slide-rule type calculator an advantage. Some carry more details than others and a particularly useful one would show the relationship of magnification, time, aperture and filter variations for colour and black and white printing. Some manufacturers produce calculators dedicated for use with their own materials and these tell you the exposure factors for colour or printing filters in their ranges. In general all these calculators are very practical and cost effective, and they are as simple to use as an aperture guide scale on the side of a flashgun.

One other very useful accessory, which is cheap to buy or to make, is a paper safe. This gets round all the problems of continually having to open and close boxes or packets of paper, with the ever present risk of chemical contamination or accidental fogging by stray light.

Commercially available types have features which include sheet-by-sheet dispensing and stacking capability which you may be able to copy in your design. But essentially all you need is a perfectly light-tight box to which you have completely unhindered, preferably one-handed, entry.

A paper safe is also useful in case you have difficulties in loading a film—or have to hold up operations in the dark while something else is sorted out. A light-proof cover, for example, can be placed over a dish for the few moments required to check a processing time, or to locate something in normal room lighting rather than in safelighting or darkness.

Aids under safelighting

One way of preventing small objects slipping off a worktop is to fix a strip of batten near its edge. But even so, objects are bound to find their way to the floor or be otherwise misplaced. Those items of equipment that you use frequently can be identified and located even in darkness if marked with special luminous stickers—these can be placed next to meter or timer switches which are not self-illuminated.

Or you may find a purpose built safelight torch of use in locating these items. The commercially available type can be set to beam red light at half or full power depending on how close you are working to sensitive material—which is likely to be b & w paper. It can even be used during colour printing providing the beam is not brought too close to uncovered paper, or used for too long. This pocket sized device can be attached to your wrist or belt.

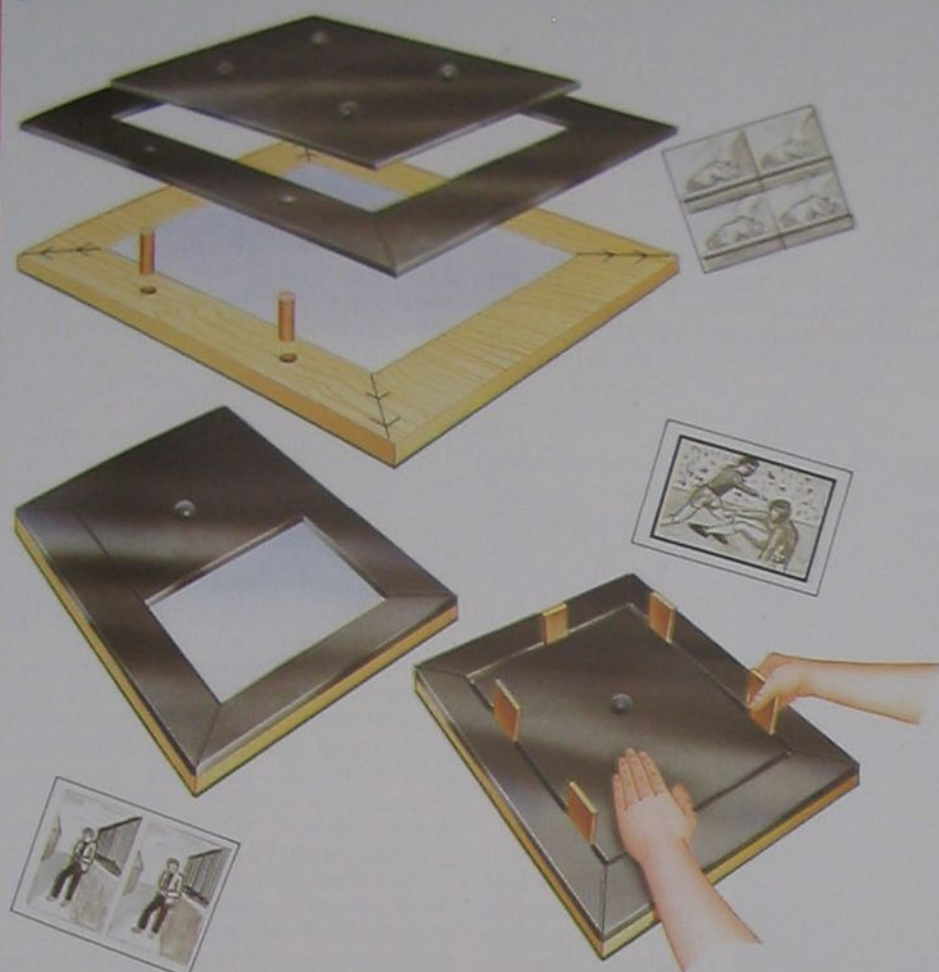
By using the appropriate coloured filter material almost any low powered torch such as a penlight could be converted for use in this way. But do carry out a suitable test to ensure that all escaping light, whether in the beam or not, is indeed safe for the materials you wish to handle at the time.

But of course the real answer to problems of poor visibility in the darkroom is to raise the standard and the



Dave King

Format books



You can make these print masks to match the print format you use. By varying the type of insert, you can print black borders as well as multiple prints

Digital readout Not only the height of luxury, but accurate and convenient too—Ilford's digital thermometer which can be obtained in Centigrade and Fahrenheit models. At the other end of the scale are these stick-on crystal thermometers which can be used to monitor solution, tank and waterbath temperatures. They are available from aquarists' suppliers

intensity of the safelighting you use. You may find it helpful to supplement existing safelighting with other units. Desk units provide useful localized illumination and can be used to inspect and choose negatives for printing. The new long-life LED type is especially suited to this application.

Substantial improvements to safelighting can be made by replacing conventional styles of safelights by fluorescent lighting units for which special 'safe' fluorescent tubes can be obtained. These are fitted in place of normal tubes to give diffuse amber or red lighting.

The same type of tube can be fitted to an ordinary lightbox to give you one which can be used—at a safe distance—as a flat safelight on which you can select the negatives to be printed. The light from this should be more than sufficient to provide the whole darkroom with safelighting.

Temperature control

Dish warmers and process solution tempering baths are useful—and often essential—if you do colour work or other processing where accurate high temperatures have to be maintained. But for less critical work, the simple waterbath is usually quite adequate, and various

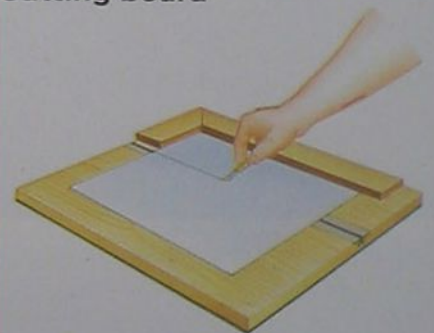
methods can be used to keep the temperature of this at the correct level (see page 518). For smaller quantities, or for process chemicals which must be raised—or lowered—to working temperature, you can simply place a jug or bottle containing hot or cold water in the dish of solution. Bottles and containers can be warmed up by directing a fan heater on them—but do take care. Beakers of solution which have to be warmed quickly can be heated up by placing hot stainless steel spoons in them—but this is really only for emergencies.

A thermometer is essential in any form of processing—but a single thermometer is not necessarily suitable for all types of work. Cheap, fairly accurate spirit filled versions should be used only to monitor ambient temperatures rather than precise temperatures—particularly in situations where there is a high risk of breakage, such as when the thermometer is left propped up in a print dish. Reinforced thermometers can be used for stirring chemicals but as so few have this sturdy structural support, it is essential to avoid the temptation. Stirring paddles, usually made of plastic, are cheap and readily available.

Mercury types are recommended for accuracy and quick reading, but if you have a taste for high technology then a digital thermometer may be an attractive alternative. This battery operated device has several benefits, the most obvious being that readings can be made and seen in total darkness. Temperatures are accurately measured and the probe can be used for stirring solution, unlike glass types.

Adhesive digital thermometers em-

Cutting board



This cutting board can be used to cut test strips or sheets of printing paper to a constant size with safety, even in very low lighting

ploying crystal displays can be stuck to any container whose temperature needs to be monitored. These cannot be removed once positioned, but form a permanent means of temperature control which can be stuck to pipework, glass and plastic. Attached to the side of a print or film processing drum, they can be used to measure the temperature of the waterbath or the temperature of the tank contents.

Quality control

Various quality control aids can be bought to special order. They can be used to check your standards of film and print processing and exposure—and perhaps to isolate specific problems which you cannot sort out. These control aids—normally used by large processing labs to monitor and to set up processing lines—usually take the form of accurately pre-exposed film or paper strips, processed or unprocessed according to their function. Though none of these accessories is particularly cheap, they could be used by a group of enthusiasts and so the costs could be shared in this way.

Kodak, for instance, supply control

strips in 35 mm size on Ektachrome 64 for checking their E6 process, or Kodacolor II for checking the C41 process, and even one on black and white film. On the printing side, you can obtain control strips 9 x 35 cm on Ektacolor paper for checking Ektaprint 2 processing, and on Ektachrome 14 for checking processing in R14 chemicals. Each set is supplied with a ready processed reference sheet showing correction factors. Agfa also produce sensitometrically exposed strips to cover their range of products and processes. These control strips should be kept refrigerated, used by their expiry date, and processed exactly like your usual film or paper.

To monitor the quality of your colour

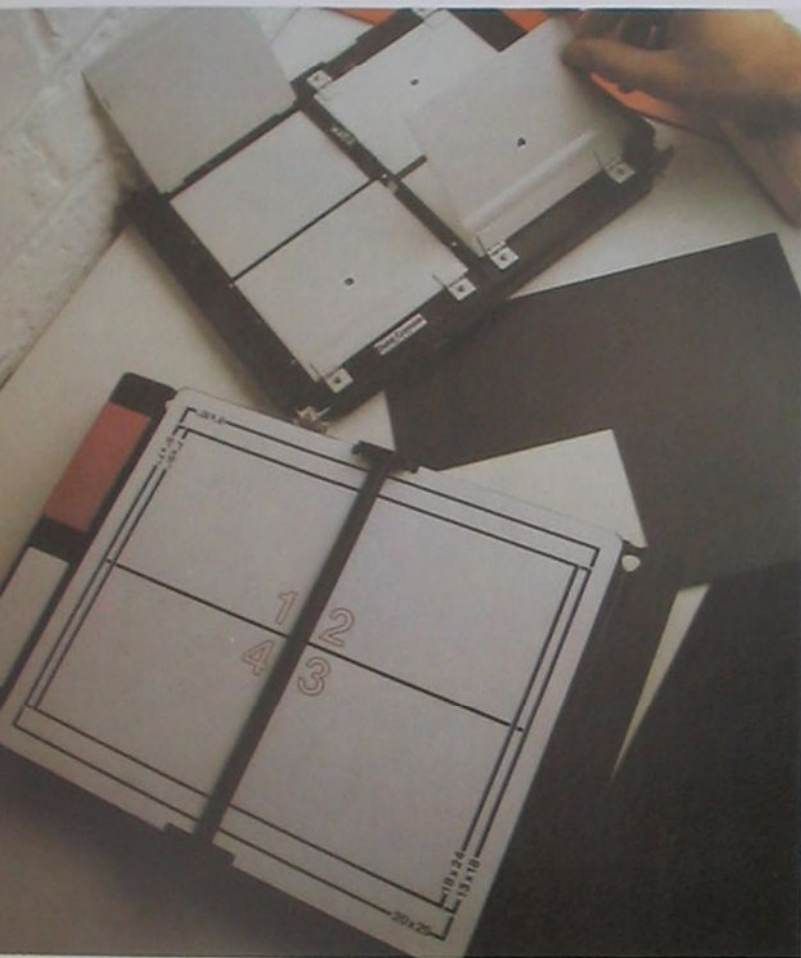
printing, several makes of standard negative can be used. These are simply strips of perfectly exposed and processed film. They can be used for making the 'perfect' prints needed for programming colour analyzers, and for trouble-shooting. If you cannot make a decent print with, say, a Vericolor II standard negative—the standard negative you buy must, of course, match the film you normally print—then you are doing something very wrong. For example, if there is a continual bias in your work that needs a good deal of correction, your filtration procedures may be wrong. If you can make a good print with the bought-in standard negative, but are plagued by casts in your other work, the bias could be caused by something common to all your negatives—their processing.

Kodak produce a range of step wedges called *photographic step tablets*. These have a sequence of increasing density patches of black silver on a clear acetate base. The increment of each patch can be 0.15 or 0.3—and these wedges are principally designed for use in making colour separations. They can also be used for comparing the relative sensitometric properties of sensitive materials—a typical use is for comparing the characteristics of black and white printing paper (see page 2238).

Poor storage, overuse and contamination of chemicals are the three main reasons why problems may occur during processing even if all the routines are carried out properly. The effects are readily noticed, in most cases during or immediately after processing. However, in black and white work the failure of the fixer may not become evident until quite some time afterwards. One accurate way

Variable formats A quartered piece of card can be used to print four images on a single sheet of paper, simply by rotating and flopping it to uncover a fresh segment. Alternatively, you may prefer either the convenient Jobo or Durst variable format masks

LED better For bench use, this new type Durst safelight, using LEDs (bottom left), is far superior to conventional safelighting. It can be used for both black and white and colour printing at a safe distance





of testing fixer life is to use a hypo tester consisting of a calibrated hydrometer. You simply read off the scales to check the condition of the fixer bath.

Note making

A personalized system of note making must be established if you want to record, with any accuracy, information to be used for later processing or printing. In colour printing, for example, it is important to note down progressive filter changes when making test prints. This information can be marked on the back using pencil or spirit ink, or better still by using a self-adhesive label on which the corresponding test information has already been written. However, you may have to 'store' this information at some time.

Calculators Electronic and slide rule type calculators can both serve a useful role—especially where filtration and exposure factors have to be considered. **Notetaker** What more convenient timer than a small tape recorder with prerecorded steps?

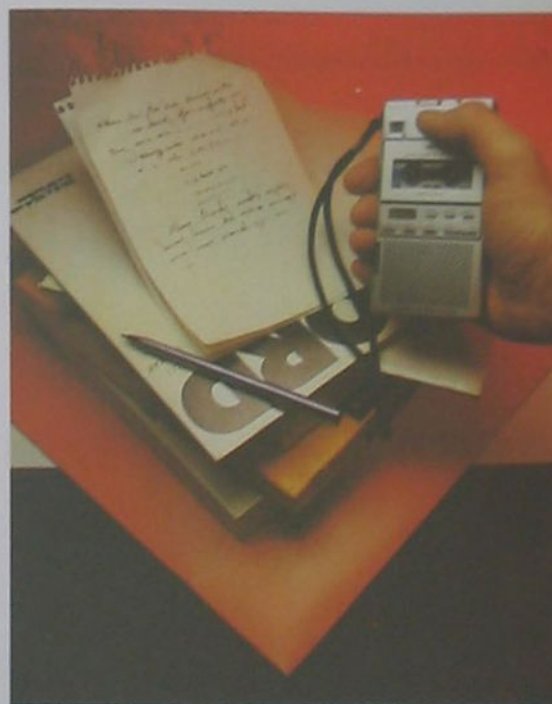
One simple method is to use a crude 'wipe clean' noteboard consisting of a sheet of white plastic kept beside the enlarger, or near your processing bench. You can write on this with a water-based felt pen, and clean it off afterwards.

Better, though, is a luminous notepad that enables you to make records of exposure and filtration clearly even in darkness. The particular advantage of this is that you could write your colour print or film processing times on the

pad and adopt any dish or tank processing method which entails working in darkness for the first part of the process. Thus you could follow the timing notes until the 'daylight' stage is reached.

Alternatively, you might prefer to use a tape recorder or cassette deck to note your exposure and filter information. Another idea is to prerecord processing instructions and play them back in the darkroom. You could even do this in 'real time' so that, once started, the player is left running and each new step in the instructions will come across at precisely the right time.

Tape recorders can be very useful alternatives to your darkroom clock or timer. You might even record a metronome so you can time your print

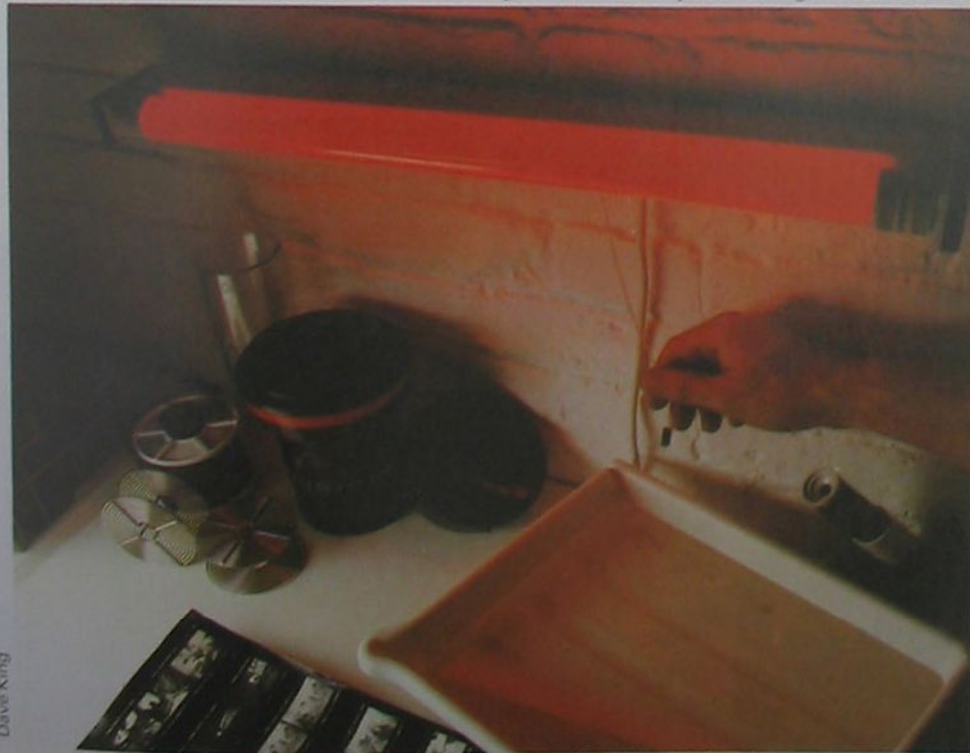


exposures without looking away from any handwork, such as dodging, that you may be doing. Battery-operated audible timers sounding at one-second intervals are especially useful in this way.

Kodak in the USA produce an interesting range of pre-recorded cassette tapes—'Kodeword' cassettes—with a number of titles that cover C41, E6, and black and white processing. They take you through the process steps in real time with explanatory text and even music between timing cues. These will be especially useful if you process colour film only occasionally.

But a cheap and effective way to keep a check on process times is to use a simple clockwork kitchen timer. A photographic process timer works on the same basis but you can set several cues on the dial instead of just one.

Fluorescent safelight Batten mounted safelight from Encapsulite gives a flood of shadowless light. Unmounted tubes are also available—and can be fitted within an ordinary lightbox to act as both safelight and viewer (far left)



Improve your technique

On the streets

Taking pictures of people on the streets can be difficult and hazardous. But following a few guidelines can help prevent you from ending up with dull pictures or a smashed camera

The streets are alive with possibilities for the photographer. Across the world the streets are meeting places where people talk, argue and celebrate. In warm weather social and domestic life spills out of the houses and on to the pavements. There are political demonstrations, street theatre groups and other, more spontaneous and unpredictable events all of which are worth photographing.

But recording this lively atmosphere with your camera is not always easy; the presence of a photographer often makes people self-conscious. So this type of photography requires a careful approach, one which demands both conventional and more unusual photographic skills.

Approaching the subject

The people in front of your camera do not think of themselves as 'subjects'. They are not photographic models, but individuals getting on with their daily lives. So although you may see them as subjects just waiting to be photographed, this view may not be shared by your potential victims. So it is important to approach people in the right way if you are to get the pictures you want, and avoid upsetting people in the process.

In most countries you are legally entitled to photograph anything in a public place (except military installations or personnel). But if you are uncaring and insensitive, people may take exception to your presence and your pictures will show this, often

showing just dull passive faces staring at the camera. On the other hand, superficial attempts at friendliness do not seem sincere and can make people feel that you are patronizing them.

The best approach is to be genuinely interested in what your subject is doing or saying. Before you start taking pictures it is worth spending some time talking or watching so that your presence becomes accepted and eventually passes unnoticed. When this happens you can photograph more freely and this helps you to take pictures which reflect the real spirit of the place or event.

A little preplanning helps enormously with developing this approach. For example, clothes are very important. It is likely that none of your subjects will know you, and so you will be judged by your appearance. The better you can fit in the more natural your pictures will be.

Normally, you do not want to attract attention to yourself, so you should not appear laden with cameras, lenses and gadget bags. You should also choose your clothes to fit your surroundings.

Establishing a good relationship of confidence between yourself and your subjects can take some time. Community groups may find your photographs useful for their campaigns or publicity and you can become more accepted by giving them prints to use. By returning several times to an area bringing pictures from the previous visit you will get to know the

In action For this shot (left) the photographer used some railings to gain height, so giving a better viewpoint. He can be seen taking the picture in the shot below





David Simson

Getting the point Sometimes getting close to the subject is dangerous. A long lens allows you to keep your distance

people better, and they will start to accept you as part of their lives. The better known you become the more you will be trusted and the easier you will find it to take pictures without having to explain yourself.

The way that you behave is also an important part of your approach. There is no point in dressing inconspicuously if you are constantly hopping up and down, changing lenses and rushing to and fro. Try to develop a quiet style of photography—move smoothly and avoid fuss. This makes your presence far less disturbing and helps you to blend into the background.

If you are taking pictures of an event, planning becomes an essential part of your technique. Without some planning you will find that you are rarely in the right place at the right time. Sources of information include the papers, the police and the press office of the organization which is running the event.

It is worth consulting a map of the area to see if there are short cuts and any high ground, bridges or buildings which could provide good vantage points. If any famous people are going to be present, make sure you know what they look like—perhaps by consulting old newspapers or magazines at your local library. At this planning stage it is often a



Richard & Sally Greenhill

good idea to work backwards—think out what pictures you want to end up with and then plan your route, timetable and equipment to suit.

Some events are difficult to plan for, however. Violent demonstrations and riots present opportunities to take dramatic and exciting pictures but can also be quite dangerous. Although you may feel like a neutral observer the participants may decide otherwise.

China talk A telephoto lens is useful when you want to avoid disturbing an intimate or peaceful scene

Once again clothes are important. You should dress in such a way as to avoid identification with either side.

If things start to get rough, try to find a sheltered doorway or get your back against a wall or parked car. It is very hard to take pictures and watch your

back at the same time. In the chaos of a riot there is always the risk that you may be robbed, or have your cameras and film confiscated by the police. So if you think you have got some dramatic or saleable pictures, leave straight away rather than run the risk of losing the pictures later.

Things happen very fast in these situations. Indeed, in any sort of street photography you need to be alert and be able to respond very quickly to sudden events. This is obviously helped if you are familiar with your equipment and can use it almost without thinking.

Handling equipment

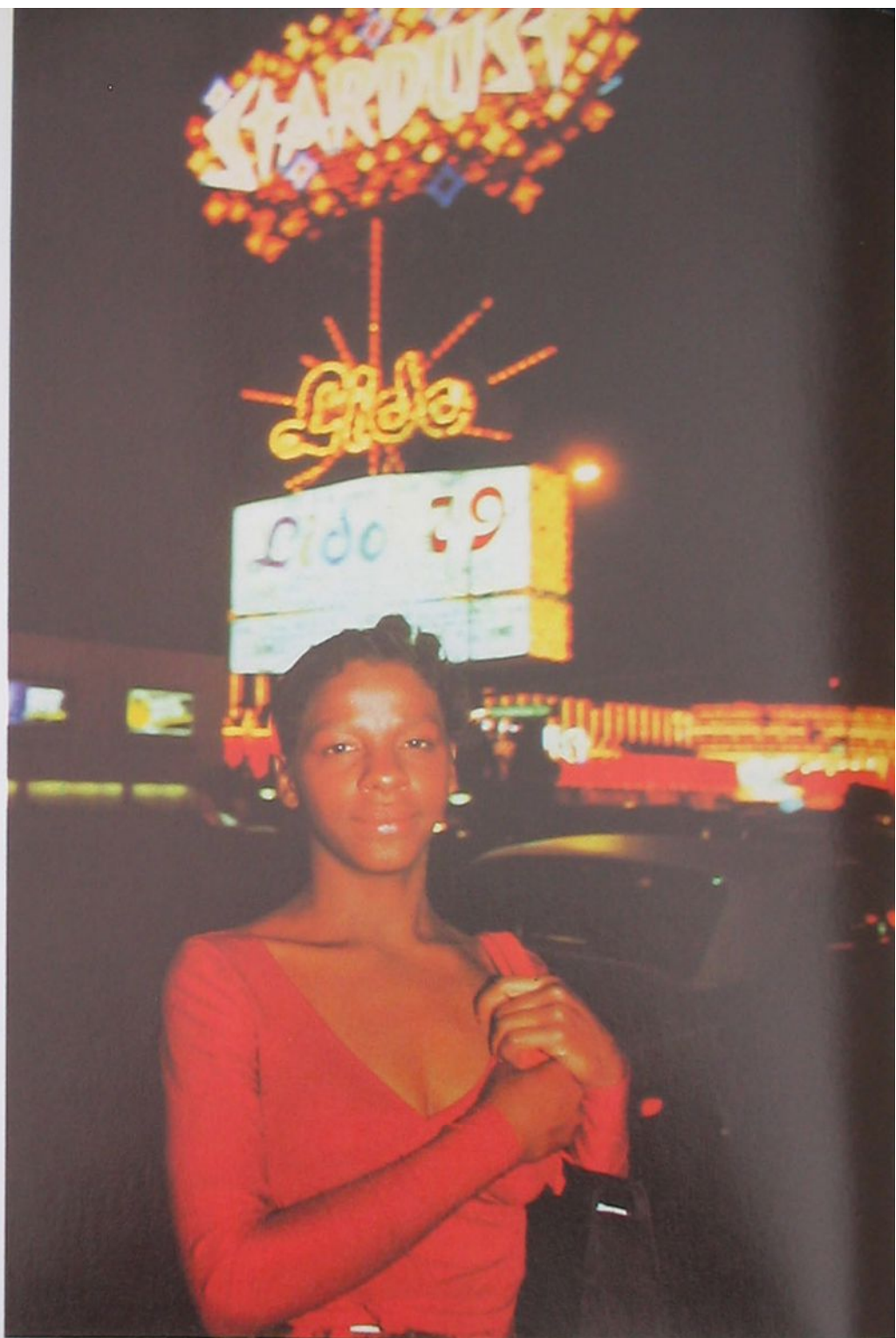
Generally you should carry as little equipment as possible. Masses of equipment just slows you down and leads to confusion. Resist the temptation to take extra equipment 'just in case'—a good rule is 'if in doubt leave it out'. In street photography things happen quickly and you need to be able to react rapidly.

The best cameras are without doubt 35 mm SLRs or good quality rangefinder models, the latter being preferred for low light work because of their bright viewfinders. If you use an automatic camera and do not have much experience in this type of photography, then a shutter speed priority camera is probably best. When you are shooting rapidly it is not always possible to keep checking what settings the camera is giving. But at least with a shutter priority camera you can be sure that the speed is fast enough to avoid camera shake. When you have gained some experience, however, an aperture priority camera is no disadvantage as you intuitively set the right aperture to get sufficient speed.

When deciding which lenses to use, the first thing to consider is how mobile you are likely to be. As a rule, long

Street girl *The background is an important part of this shot, and was included by using a wide angle lens*

Ski street *You must be familiar with your equipment so that you can respond quickly when you see something unusual like this*



telephotos and zooms are not very useful. They are big and heavy making them difficult to carry and use, and tend to have quite small maximum apertures which limit their versatility. However, if you are unlikely to be able to get very close to your subject then a medium to long telephoto might be needed. Similarly, if you are stuck in one place, and so cannot change compositions by moving, then a zoom is useful.

But when you have a fair amount of mobility, it is far better to use a wide angle lens and get in close to the action. This gives greater immediacy to your pictures and also lets you show the subject in the context of its surroundings, the great depth of field of these lenses ensures they are sharp.

You will often find that there is little time for critical focusing. But when you are using wide angle lenses this rarely matters—as long as the focusing is roughly correct, depth of field brings your subject into focus. It is a good idea to use the smallest stop which the light conditions and subject allow (it is not a good idea to use a slow speed with fast moving subjects, so a wide aperture might be necessary to allow a fast shutter speed with such subjects).

To make rough focusing even easier, you could try using one of the focusing aids such as matchsticks or stickers on the lens barrel (see pages 1346 to 1349). Alternatively, you could use the hyperfocal distance of your lens for the aperture in use (see pages 962 to 963).

It is essential that you know your equipment very well. You should know, without looking, which way the focusing ring turns to go towards infinity; which way the aperture ring turns to open up; and which way the shutter speed ring turns to get a slower speed. Using lenses made by the same manufacturer is an advantage here as there tends to be greater consistency in this respect, and also in the layout of the lenses—whether, for example, the aperture ring is in front of or behind the focusing ring.

Carrying your equipment also needs some careful forethought. Bright shiny cases, especially those with the manufacturer's name on them, are very



Valérie de Narbonne

conspicuous and best avoided. Hard cases are strong and handy to stand on when you need a little extra height but can be bulky and are impossible to use on the move.

A soft bag is useful, but better still is a sports holdall or fishing bag. These are easy to get things out of while you are moving and do not make you look like a photographer. If you are able to manage without much equipment you may find that a jacket with plenty of pockets can carry all the equipment you need without the need for a bag at all.

Your choice of film depends very much on the subject you are covering. When shooting in black and white most reportage photographers prefer to use 400 ASA (ISO) film such as Tri-X, as this has excellent latitude and enables the photographer to work in conditions ranging from bright sunlight to dim interiors without changing films. And in daylight it allows you to use a small stop for large depth of field.

Things are slightly different if you want to shoot in colour. Fast colour films do not give particularly good quality, and as a rule it is best to shoot with the slowest film that suits the conditions. If

City couple Using a wide angle lens and preset focus allows you to grab shots, even without looking through the camera

you want prints, and feel that you are unlikely to want to sell the pictures, you should use colour negative film, as this has good exposure latitude and also allows you to correct any colour casts (caused by unusual lighting conditions) at the print stage.

If you think you might be able to sell your pictures, or if for any other reason you want to reproduce them, then you should shoot on transparency film for colour. Transparency film has superior sharpness and colour saturation to negative film and so is preferred for reproduction. And remember that if you want to sell some pictures of an event to the press, you need to get the pictures processed fast before the shots lose their immediacy, or somebody else does the same before you! This means using films which are capable of being rush processed, such as Ektachrome, as opposed to Kodachrome which can take several days. No matter how good your shot, if it is yesterday's news it is often worthless to the media.



Dancing bears Street entertainers make interesting subjects, but you may have to make a contribution in return for taking the picture if you are to avoid trouble

Modern Mohican Odd subjects need to be photographed in suitable settings, so you should always be aware of the backgrounds in your shots. Here the dilapidated building is an appropriately wild location

John Garrett



Homer Sykes

CCD Cameras

A silicon chip called a CCD—already in use in video cameras—may revolutionize still photography in years to come. Instead of using film or even tape, electronic still cameras use magnetic discs to record pictures

Electronics and silicon chips have become increasingly important in modern cameras, taking over functions previously carried out by springs, cams and other assorted mechanical devices. And now, in a recently developed type of 'video stills' camera—the CCD camera—even the film itself is dispensed with.

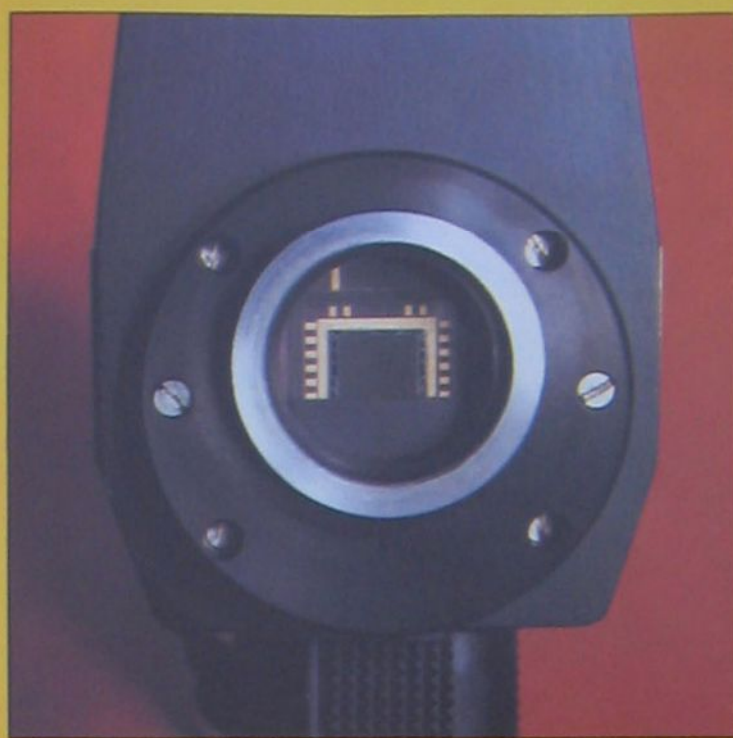
Instead of film, such cameras contain a special type of silicon chip, known as a Charge Coupled Device (CCD).

The CCD is an important development in electronic imaging—that is, video rather than film pictures. Although the images produced are similar to standard video pictures, the CCD has several advantages over the tube in video cameras (see page 2274)—it enables cameras to be smaller, cheaper and easier to manufacture. So it is possible to build cameras, such as the Sony Mavica (Magnetic Video CAmera), which are about the same size as an ordinary 35 mm SLR.

The image recorded by the CCD is viewed using a TV set, though it is also possible to make prints using ink jet, needle or thermal printers like those used to produce 'hard copy' with computers. This type of print is made up of dots, similar to a dot screened reproduction (see pages 1128 to 1129). But in spite of the apparently vast differences between the conventional silver halide image and that produced by the CCD, they are actually based on the same principle.

How the image is formed

When light hits certain substances, such as silver halides and silicon, it causes electrons to be released (see page 1570). These electrons can be used either as the basis for a chemical process, or to influence an electrical current. Conventional silver



Video CCD This CCD is being used in a video camera which is smaller and lighter than one using a conventional vidicon tube. Half of the CCD is shielded to store the image during readout

emulsions are based on the first method. CCDs on the second.

The camera contains just one CCD which is approximately 7 mm x 9 mm. Its surface consists of rows of tiny sensors in grid formation (a matrix), known as *pixels*, which are electrically isolated from each other. The Mavica, for example, contains an array of 490 x 570 pixels within its format.

When sufficient light energy hits a pixel, it releases an electron which is stored in a 'well' below the sensor. So the intensity of light falling on each sensor is represented by the number of electrons stored in the wells. The electrons have a negative electrical charge and they provide the electrical information from which the image is built up.

When the exposure is complete, the video image is created using the stored charges. This is done by

applying pulsed voltages to the CCD electrodes. These move the charge packets repetitively from one well to the next along the device—called *charge coupling*—until the charges eventually leave the imaging area one at a time. Rows of charges can be read out of an output register into an amplifier built in to the chip. The resulting output at any time is then proportional to the light intensity on the part of the sensitive area from which the detected charge packet originated.

The structure of the device makes sure that charges are read out from one line of pixels after another, exactly as from a conventional television camera. These charges can be used to form an image directly (as *analogue data*) for feeding into a TV set—each line of charges producing one line of the TV scan—or for storing on magnetic tape using a

recorder. In the latter case, however, it is often better if the charge is first converted into a number code (*digital data*).

When all the wells have been cleared, and the complete image has been built up on the screen or on the tape, the CCD is ready to be exposed again. This happens very fast—indeed, CCDs were first used in video movie cameras—so it is possible to get the equivalent of a motor drive sequence.

In the case of the Mavica, the image is stored on a reusable magnetic disc which is loaded into the camera, exposed, and then removed. The image information is then drawn off the disc by a suitable transcription device which reproduces images in the forms described above.

courtesy of English Electric Valve Co. Ltd.

Coloured images

Colour pictures are obtained in one of two ways. The simplest uses a single CCD with each pixel located behind a blue, green or red filter. The signal from the pixel is then coded to give the same colour when the image is played back or printed. The pixels are arranged in groups of three so that other colours are built up by combinations of the three primaries (the mixing of colours takes place in the eye of the viewer, not in the picture).

The other method is to use three CCDs and a dichroic beam splitter like that used in triple tube video cameras (see page 2274). The three separate images are then optically merged to give the final coloured image.

Image quality

The quality of CCD images is similar to normal TV pictures so the resolution is much lower than that obtained with film. Great improvements have been, and will be, made in increasing the number and

decreasing the size of the pixels. But there are certain practical limitations—for example, it is not possible, at the moment, to further reduce the size of the wells and still get them to work reliably.

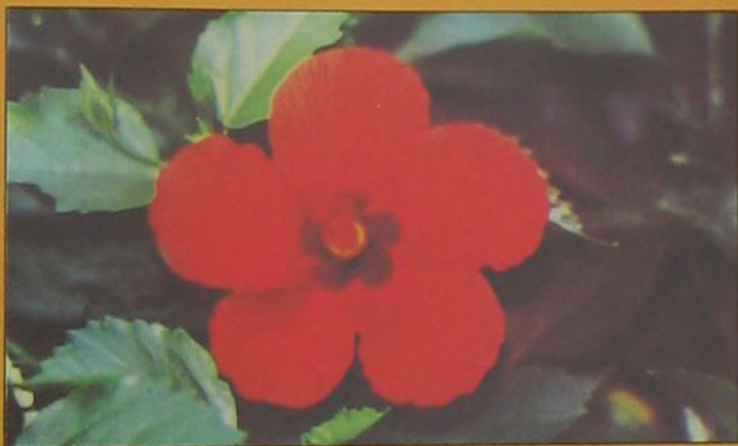
The number of picture elements in a Mavica picture is around 280,000. This may seem a lot at first sight, but when compared to an ordinary silver image which has the equivalent of millions of picture elements, the limitation of image quality can clearly be imagined. And although CCDs will be improved, so will the performance of conventional films. However, the CCD does have some special features which make it useful.

The silicon sensors are very efficient when it comes to converting light energy into electrical energy, especially when compared to silver halides. The Mavica system is quoted as having a 'speed' equivalent to 200 ASA (ISO). But it is possible that, using amplifiers, the effective sensitivity of a CCD could be as much as 125,000, or more. If it were possible to push film to that speed, the resolution would be no better, and probably worse than the CCD image. The CCD is also sensitive to



Mavica Sony's prototype CCD SLR features interchangeable lenses and reusable magnetic discs

Printout Mavica pictures may be shown on a TV or can be printed using a special ink jet machine. Quality is limited



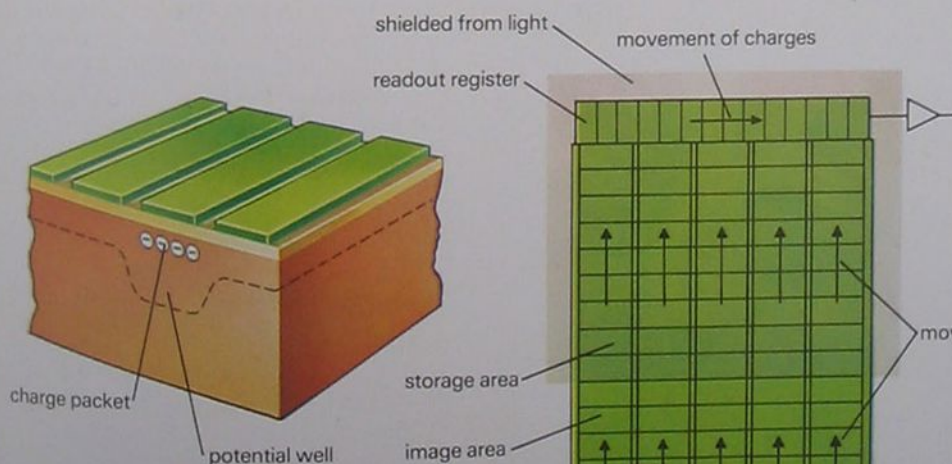
infrared, and so it is useful for low light work.

There is no shutter as such in the camera. The exposure time is governed by how long the CCD is switched on. The exposure time is normally around 1/60 second, but can be varied to give faster 'speeds' for freezing action. However, the lenses used with this type of camera still have variable apertures to keep the light intensity within certain limits (and to give depth of field control).

Once the picture is taken, it is possible to transmit the recorded image by normal telephone lines, using special transmitters and receivers. This makes CCD cameras the ideal tools for press photographers. And as the image is already composed of dots, it may be possible eventually to feed the recording directly into a scanner to produce a half-tone separation for printing, without the need for an in-between transparency.

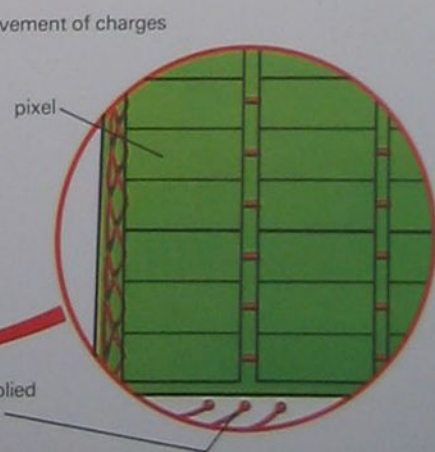
In the foreseeable future, solid state devices such as the CCD will not replace conventional film in areas where good image quality is required. But they may become popular for snapshots, instant press photographs and stills for television.

How CCDs work



Potential well A voltage (10-15 V) applied to a picture element creates a site where electrons will prefer to gather—a potential well. Electrons, produced when light falls on the device, will collect in the well, whether produced on that electrode or adjacent ones which are maintained at a different voltage to act as a barrier to the charge packet's movement

Charge readout The storage electrodes are connected in threes, each group forming a pixel. The potential well is moved up the columns by applying voltage in a step by step fashion, so the charge packets move from the image area to the storage area, which is the same but is shielded from light. Once there, the top line can be read out in the same way, creating the output signal, while another exposure is made on the image area. A framing rate of 60 pictures a second is possible with the Mavica—faster than a movie camera!



THE MINIATURE REVOLUTION

In the mid 1920s German manufacturers produced some revolutionary cameras that, because of their small size and versatility, were to change the face of photography

It is hard to imagine life without the 35 mm camera. Most people, whether or not they are interested in photography, expect their newspapers and magazines to contain lively, exciting photographs from the thick of the action, whether the

subject is a guerrilla war or a garden party. Yet the vast majority of such pictures are taken on 35 mm—and without these 'miniature' cameras, as they used to be called, illustrations in the media would look very different.

Until the development of the 35 mm still camera in the 1920s, photographers were restricted by their large cameras taking glass plates, and by bulky flash equipment using big bulbs in any interior. Strangely enough, however, people were slow to realize the advantages of miniature cameras, and the story of their acceptance is a fascinating one. For not only did they make life easier for photographers, they thoroughly transformed the publishing world.

Using such revolutionary cameras as the Ermanox and the Leica, a succession of photographers appeared whose whole approach to their art was completely different. The work of photographers like Salomon, Eisenstaedt, Kertész and Cartier-Bresson ensured that photography would never be the same again.

The first of these revolutionary cameras, produced in 1924, was the Ermanox. Although it only took 4.5 cm x 6 cm glass plates or cut film this was a very compact camera and its lens was *f/2* (later increased to *f/1.8*) which meant that its users could, for the first time, take photographs at night or inside buildings without using flash.

Nevertheless, in the same year another camera was produced which was even more of a breakthrough. This was the Leica—the first truly versatile miniature camera.

The inventor of this camera was Oskar Barnack, a technician at the Leitz optical works in Wetzlar, Germany. The Leica was a fairly simple piece of equipment, but it incorporated several innovative design aspects—an all-metal body, a gearing mechanism that advanced the film and cocked the shutter in one movement and, most important of all, the capacity to use standard movie film.

This latter aspect meant that users could expose 36 negatives before changing the film. Barnack had at first made the frame format, exactly the same as that of a movie camera—24 mm by 18 mm—but he found that the negatives were too small for good enlargements. So he doubled the frame area to the now-classic 24 mm by 36 mm. Even with the coarse grained film stock of the time, this bigger format produced reasonable prints and Barnack was well pleased with his invention. He tested it in all kinds of different situations and his results included the documentary style of work with which the camera was later to become synonymous.

The Leica I Model A was put into full scale production in 1924, just six years after the end of World War I. It was a period during which Germany underwent a cultural, social and political metamorphosis. For the first time in its history the country had a democratically elected government, and the petty conservatism and formality that had stifled

The first cover of 'Picture Post' with its leaping cowgirls heralded a new type of magazine whose varied articles and original look was to be popular for 20 years



social and artistic life in the past was gone. New technologies—aviation, automobiles, radio—were being vigorously expanded while, in the cultural field, experiments in painting, photography and cinema abounded. It was as if a whole new society were being formed.

In the forefront of this new society were the picture magazines which helped both to change Germany, and at the same time, reflected that change. It was in their pages that modern photo-journalism was born.

In the early 20s press photography had driven itself into a cul-de-sac. Equipment was awkward and outdated and the attitudes of most photographers and their editors were hardly any better. But a few magazines did struggle for a more creative use of photography. The three most important of these were the *Berliner Illustrierte Zeitung*, the *Munchner Illustrierte Presse* and the communist paper, *Arbeiter Illustrierte Zeitung*. Although AIZ printed some truly remarkable pictures, the political bias of the magazine limited its readership and hence its immediate effect on the development of photography. The main impact on the growth of photo-journalism and on the use of the miniature camera came from the rivalry between the other two magazines.

In 1928, the *Berliner Illustrierte* achieved something of a coup. It began publishing work by a complete newcomer to press photography—Dr Erich Salomon. The pictures were of a League of Nations conference in Geneva, but instead of the usual dull formal shots of the world leaders lined up for a photocall and grinning sheepishly, here they were captured off-guard, deep in earnest conversation or sharing a joke over an after-dinner coffee—the first 'candid camera' shots—as an appreciative English editor called them.

The camera that Salomon used was the faster but less versatile Ermanox. It was

small enough to be easily carried and, if necessary, easily concealed. On one occasion, Salomon had secretly photographed the headline-making trial of a notorious murderer, smuggling his camera into the court in his bowler hat, which had a small hole cut in it for the lens to peek through and concealing his tripod in a scarf.

Such antics apart, Salomon's greatest contribution to photography was his coverage of political events, for it was here that the uniqueness of the man and his camera combined to revitalize both the nature of press photography and the nature of the press photographer.

Unlike most pressmen, Salomon was highly educated. He was fluent in several languages, cultured, able to approach prime ministers and diplomats on equal terms and quite capable of bluffing his way into the most august gatherings. At one international convention he even took the seat of the Polish delegate who had failed to turn up. His unassuming manner and cultivated conversation won him many friends in diplomatic circles and they helped him gain access to the great leaders of the time. Eventually he became such a feature of these political gatherings that the French Foreign Minister, Aristide Briand, remarked, 'There are just three things necessary for a League of Nations conference—a few

Erich Salomon in characteristic guise as the discreet guest at political gatherings with his ever present Ermanox

It's that Salomon again! Aristide Briand points as the photographer snaps a bevy of French politicians at a banquet in 1931

foreign secretaries, a table—and Salomon.'

But despite Salomon's masterly results, the Ermanox was not an easy camera to use. Accurate focusing on the ground glass screen was particularly difficult, and the plates were so slow—about 32 ASA (ISO)—that even at full aperture exposure times indoors were often a quarter of a second or more. A tripod was essential, as was the ability to judge the right moment to make the exposure. In order not to disturb his subjects with the clatter of the Ermanox's focal-plane shutter, Salomon fitted a virtually silent Compur shutter over the front of the lens, operating it from a



Lotte Feininger/The John Hillelson Agency



Announcing Leica's arrival in 1925, the words of this advertisement were to prove truly prophetic, as the so-called miniature camera swept its competition from the field

**REVOLUTION
IN DER PHOTOGRAPHIE
BEDEUTET DIE
LEITZ-LEICA-KAMERA**



discreet distance of a few metres with an extra long cable release.

But there was one further disadvantage to the Ermanox that even Salomon could not overcome. The sheer bulk of even a dozen glass plates, and the need to change plates after every exposure, made the camera quite unsuitable for shooting the photoessays for which, from 1930 onwards, there was an increasing demand. It was here that the 35 mm camera really came into its own.

Today we are all familiar with the advantages of 35 mm cameras, accepting them without a second thought. But 50 years ago, 36 exposure film, rapid and precise rangefinder focusing, and interchangeable lenses for a compact and portable camera were little short of miraculous. For photojournalists in particular, the new equipment meant an escape from the static, single shot techniques of the view camera, permitting them to develop a story through a sequence of related pictures and to experiment swiftly with different camera angles and compositions.

In early 1929, the *Berliner Illustrierte* devoted a full three pages to a story by the Hungarian photographer, André Kertész, about an Order of Trappist Monks living in France. The story created a sensation, partly because the photographer had penetrated a hidden world and partly because of the amount of space the magazine had given to a single subject. Other periodicals were quick to follow the *Berliner Illustrierte's* lead. In both presentation and story content, magazine photography was never to be the same again.

Another extremely influential photojournalist was Felix Man who worked for the *Munchner Illustrierte*. One of his most remarkable stories was on the nightlife of Berlin's Kurfürsterdamm in 1929 which revealed both its glamour and its seedier underside. Another on the Italian dictator, Benito Mussolini, was a far cry from the standard adulatory style of a formal profile and was published in 1931.

Not all these stories were to be about exotic or unusual subjects. The public had acquired an insatiable curiosity about every aspect of life at home as well as abroad. The illustrated magazines obliged them by printing in a single issue a number of photoessays on matters as diverse as motor racing at Nürburgring, a child adoption agency in Italy and a profile of the Irish playwright George Bernard Shaw.

At the same time, magazines and newspapers frequently ran stories that were specifically about the way in which the camera lens sees the world. These had titles like 'Beauties of Every Day', 'The World from Above' or 'Journey of Discovery with the Camera'. The appeal of these photographs was that they revealed to the reader the familiar day-to-day world in a way that was new, exciting and different. The street outside the window, the trees and plants in the park, even items as mundane as clothes

A striking cover
From a July 1931 issue of *BIZ*. Taken by Martin Munkacsy, one of *BIZ's* star photojournalists. He was later to be one of the highest paid photographers in the United States where he emigrated in 1935 to escape the worsening political situation in Nazi Germany

Chinese apothecary
Photoessays, like this by Walter Bosshard, benefited from the imaginative layout used in *Berliner Zeitung*. Bosshard travelled extensively in Asia and was famous for a remarkable series of photoessays on the Gandhi peace movement in 1930 which were published in the *Munchner Illustrierte*



Martin Munkacsy/Ultimate Bildagentur

Chinesische Apotheke

Kräuterreier - Hirschgeweihmedizinen -
die kostbare Schen-schen-Wurzel



Ein Mann bereitet Kräuter in der Apotheke vor. Im Hintergrund sind die Regale mit den verschiedenen Kräutern zu sehen.

Die Apotheke ist ein Ort, an dem die Menschen ihre Krankheiten behandeln lassen. Hier werden die verschiedensten Kräuter und Wurzeln verwendet, um die Gesundheit wiederherzustellen.



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Ein Mann liest in der Apotheke. Im Hintergrund sind die Regale mit den verschiedenen Kräutern zu sehen.

High jinks Munkacs's photoessays often captured some of the more light-hearted aspects of life in the early 1930s

pegs were transformed by the careful use of light and lens. Things that would once have been considered far too insignificant to waste film on were suddenly discovered to have great photographic possibilities if looked at in a fresh way.

It was not that a miniature camera was necessary for this new way of seeing, or even that it was always used to take this kind of picture. But the miniature camera made experimental work of this type much easier. The actual 'way of seeing' was essentially no more than being used to seeing in terms of photographs. The more subjects that both professional and amateur photographers found to photograph and the more the general public became used to seeing photographs reproduced, the more the 35 mm camera came to dominate the photographic world. Inevitably, as they became increasingly important, camera manufacturers were encouraged to improve their products to serve the market.

In 1931 Leica brought out the Model C. This was the first 35 mm camera with interchangeable lenses—initially an $f/3.5$ 35 mm wide angle and an $f/4.5$ 135 mm telephoto. The next year, their great



Martin Munkacsi/Ullstein Bilderdienst

Berliner Illustrierte Zeitung



Ein Frühstückstisch mit zwei Gästen und drei Bedienten in der Berliner Illustrierten Zeitung



Ein Frühstückstisch mit zwei Gästen und drei Bedienten in der Berliner Illustrierten Zeitung

rival, Zeiss, introduced the Contax, which incorporated a built-in range-finder of the split-field type for more accurate focusing. Lenses too were becoming ever faster—apertures on standard lenses were up to $f/1.5$.

Film stock, too, had dramatically improved both in definition and in sensitivity. The earliest movie film used was 17 ASA, even slower than the speed of glass plates, though by 1932 35 mm film of 100 ASA was being made by Agfa. But it was some years before an even faster film stock was available.

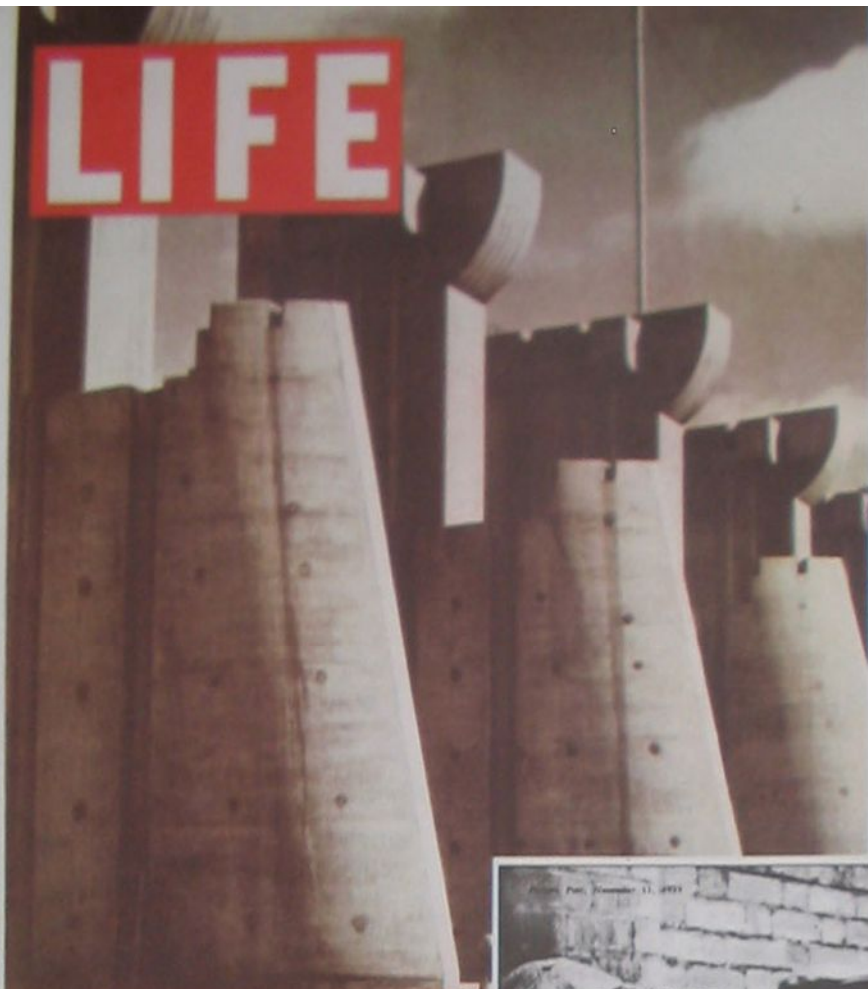
Despite these continual improvements, the miniature camera did not have everything its own way—even among photojournalists. Many of them continued to use medium format cameras on at least some occasions. A favourite model was the twin-lens Rolleiflex, introduced in 1929, which even today is still prized by some photographers for its reliability and excellent picture quality. Another camera beloved of some photoreporters was the Plaubel Makina with an $f/2.9$ lens. When not in use the lens could concertina into the camera body, so that the whole camera became a mere 50 mm thick. Although basically a plate camera, it could be fitted with a twelve shot film pack instead of a single glass plate.

Advances in camera technology continued up to the start of World War 2 in 1939, but the best camera in the world is of no use to photojournalists unless they have the freedom to publish the results.

In Germany in 1933 that freedom came abruptly to an end. Hitler had been made Chancellor—the Nazis were in power.

Almost immediately, the editors of all the leading magazines were replaced. Some were imprisoned, others fled abroad. Many other photographers and journalists soon saw that they too had no future under a dictatorship and took their talents elsewhere, mostly to France, Britain or the United States. Over the next few years Germany's loss was these countries' gain as the ideas and the individuals that had made the German magazines so inventive and so successful were scattered around the world.

Among the pool of talent that gradually moved west were Hungarians such as Martin Munkacs, Kertész and the famous photojournalist Gyula Halász, better known as Brassai. From Germany came the photographer Alfred Eisenstaedt and the brilliant young editor of the *Munchner Illustrierte Presse*, Stefan Lorant. After some adventures in Hungary, Lorant ended up in Britain where, in 1938, he became the first editor of a new magazine, *Picture Post*. Although Britain had a long history of press photography and the *Daily Mirror* had been running a regular picture page since 1908, there had never been anything like *Picture Post* before. The first issue sold out completely on the same day it appeared on the news-stands. The key to its success was in its use of photography. And its photographers included Lorant's fellow refugees Felix



NOV

Photographer at work *The small cameras enabled Felix H. Man to penetrate previously forbidden areas, like this operating theatre. It was published over seven pages in the first issue of 'Picture Post'*

The page layout of *Picture Post* had been designed to the proportions of a 35 mm negative which made arranging the photographs much easier and more effective. And where other magazines might illustrate a story with two or three pictures, Lorant would give it eight to ten pages; and when a writer and a photographer were sent out on a story together, it was always the photographer who mattered most. This was something of a shock to the journalists who had been used to things being the other way round. But as far as Lorant was concerned, if there were no pictures, there was no story.

Two years before the launching of *Picture Post*, a magazine appeared in the United States which was to become a byword for the best in photojournalism. On 23 November 1936, the first issue of *Life* was published. It contained picture stories on subjects as disparate as



SOME OF THE PICTURES THE AUTHORITIES KEPT BACK: *The Men Who Stand and Wait*

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Our cameraman photographed these Wignans standing outside a Labour Exchange. The authorities asked to have all pictures left with them to be checked up. When the batch was forwarded on to us, this and other pictures on these pages were missing. They were considered unsuitable. We're much obliged to the authorities for the new prints of some of these missing pictures.



The Men Who Dream About Coal

Francis Dwyer (left) is nursing the youngest of his nine children. His eldest son, in the corner, is a soldier just home from the pit. Father Dwyer used to be a miner, too, but when he fell out of work, he became a bill distributor. The room is the parlour of one of the new Council houses.

to flood. The cost of pumping out water to re-open them is excessive. The possibility is that they will never produce coal again. What is it business to the mining labour?

The solution would appear to be the transfer of unemployed miners to new industries. The Corporation have made strenuous and not altogether unsuccessful efforts to attract new industries to the town. These are psychological difficulties.

It is customary to regard a man's life as the hardest, the most dangerous and the most unpleasant in industry. That is probably correct. But it is also true that for that very reason, the profession attracts a fascination over the majority of men who serve them. It is difficult to tempt women—even ex-miners—to forsake them completely, though the industry is not a desirable one.

they are very adaptable. The miners work in three 7½-hour shifts from 7 a.m. to 2.30 p.m., from 2.30 p.m. to 7 a.m. and from 11.30 p.m. to 7 a.m. Colliers earn about £10 to £14 a shift; draftsmen, a Lancashire man meaning 'men', earn about £10 a shift. Draftsmen look after the roofing. They do two or six weeks a week.

Mill girls work from 7-45 a.m. to 5-30 p.m., with an hour for lunch; they carry their lunch in the mill in baskets and billy cans. They are employed on piece-work and average about 12¢

In the streets of Wigan, you may recognise the mill girls by the cotton fluff which catches in their hair. The miners' faces are veined like chamois, where the coal dust has worked into old cuts and injuries, and tarred their chins. The miners are as proud of these marks as German

childbirth, dam-building, and the black widow spider and launched the photo-journalistic careers of photographers of the calibre of Margaret Bourke-White, Martin Munkacsy and Thomas McAvoy.

More than any other magazine, *Life* from its inception set a global standard on the use of photography to tell a story. The initial issue's editorial made it plain how important pictures were going to be to the future of the magazine. 'To see life; to see the world, to eyewitness great events... to see and take pleasure in seeing; to see and be amazed, to see and be instructed.'

In its philosophy, *Life* had modelled itself closely on the French Magazine *Vu*, founded in 1928 by Lucien Vogel. This in turn had been created in imitation of the German picture magazines, and a number of the German photographers who had fled Nazism, Alfred Eisenstaedt among them, came to work for *Life*. But surprisingly, the editors would not at first allow their photographers to use 35 mm, unconvinced that the small negative could produce pictures of the quality they demanded.

To change their minds, staff photo-

V-J Day, August 1945

Alfred Eisenstaedt's famous picture of a happy sailor and his girlfriend celebrating the USA's victory over the Japanese, in Times Square, New York. Eisenstaedt invariably used a Leica camera

Wigan A layout from a nine page photo-essay on the town from a November 1939 issue of *Picture Post*. Taken by the great German photojournalist Felix H. Man, it was a typical and stunning example of the kind of concerned photography for which 'Picture Post' and its editor, Stefan Lorant, became famous

Alfred Eisenstaedt/LIFE © Time Inc. 1945/Corbis



The Boy Who Wants to be a Miner His father and his grandfather were miners. It's his ambition to be a miner, too. He does not read the Ministry of Labour Statistics of unemployment. He does not know how many pits have been closed. He does not even know that, of nineteen houses in Greenhough Road, where he lives, often only four families have work.

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grapher Thomas McAvoy took a whole series of pictures at an official reception in Washington with a Leica he had brought back from Europe. The resulting prints, full of vitality and atmosphere his colleagues had been unable to capture with their cumbersome press cameras, persuaded the magazine's management that they had been mistaken. 35 mm soon became the standard format.

The change came about slowly, and some photographers had to resort to the trick of having large duplicates made of their negatives, to make editors believe that they had taken their shots on large format cameras. The deception worked, for the results were often just as good.

In a little over ten years, since their first appearance in 1924, miniature cameras like the Ermanox and the Leica fundamentally altered the techniques of photography. And the new cameras changed both the use of photography for illustration and the public's understanding of what the camera could do.

For this was more than just a technological revolution. It was also a revolution in seeing. As lenses became faster and film became more sensitive and finer grained, the miniature camera freed professional photographers, and especially editorial photographers, from the ground glass screen and the heavy tripod, allowing them to use the camera as they had always wanted to use it: as an extension of the eye.



Shelters Against the Bomb A.R.P. trenches are being dug in the areas where flame-alarms are in progress. They will be covered with earth, on which grass, for play, and, and be used.

And Shelters Against the Rain He is 27. He is a miner by profession; but he has been nine years out of work. He lives in the Hardybuts—a row of slum houses which are to be replaced by Council houses like that on the left-hand house. More than two thousand Council houses have been built, but there are still slums.

Pictures on a disc

Kodak's disc camera was primarily designed for the snapshotter but we wanted to see what could be produced in the hands of a professional

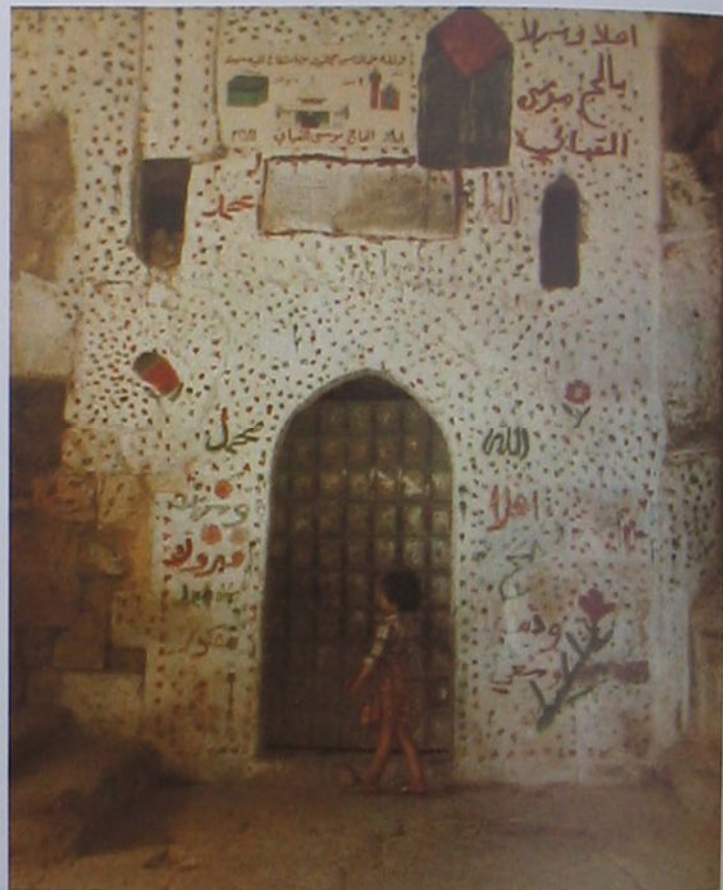
Most cameras are designed to allow the photographer to make at least a few of the basic decisions which regulate exposure, focusing or adding flash when the natural light level is too low. However, Kodak's range of Disc cameras is designed for the snapshotter who prefers to make as few decisions as possible but still be guaranteed of success with every shot. The camera's lens is fixed focus while film advance and exposure are automatic. When the light level is low, a built-in flash goes off automatically.

To find out what a professional would make of such a camera, we gave a Disc 4000 to Homer Sykes, asking him to take it with him on a trip to Israel. Most of the shots he took were around the market in Jerusalem. As well as exposing four discs of

film—each one contains fifteen negatives—Homer also took along a 35 mm camera just to take a few shots for comparison.

He found that the camera was a delight to use—no thought had to be given to changing lenses, adjusting exposure or focusing, or even taking care of extremes of contrast. Without any controls to worry about, the camera was ideal for street photography where a response could be made instantly by just pointing and shooting. 'This is the sort of photography I love', explained Homer. 'I wish I could do this type of thing all the time. You can forget about everything else and just concentrate on the subject and the image you see in the viewfinder.'

Full automation meant that he could literally point and



Woman sitting The disc camera was ideal for the candid shots that Homer likes to take since no time is taken up by things like focusing or adjusting the exposure setting. This allowed him to concentrate on capturing natural expressions

Headgear The point and shoot feature of the disc camera was also useful for grabbing quick shots of moving subjects. Here,

Homer composed the basic shot (left) and then waited for an interesting figure to walk into the picture

Painted wall The viewfinder proved to be very accurate for a snapshot camera and the care which Homer took over his compositions can be appreciated in the final shot (above)—though the child's face has lost detail because of the grain



Man and helmet The tiny disc camera looks far less threatening than a full sized SLR so Homer found that people were not so suspicious about having their pictures taken—even at very close range

In the doorway The fixed focal length of the disc camera's lens forced Homer to take many of his pictures a certain way—here he was unable to move further back. However with his 35 mm SLR (below), he was able to fit a 28 mm lens and take in the whole scene including the man who was standing in the right part of the picture area. Notice the difference in image quality between the two shots



American tourists The novel appearance of the camera aroused plenty of interest and occasionally provoked an amusing response

shoot, allowing him to take some photographs that would have been impossible with his 35 mm camera. For instance, when two young boys ran around a street corner and suddenly appeared in front of him, Homer was able to fire off a shot and the camera automatically set off the flash to add light to the shadowed street. For candid shots the camera was also ideal because it was too small to be noticed and could be held up and fired at the last minute. Generally, he found that the camera was better suited to relatively close subjects rather than for distant views. The coarse grain tended to break up the detail of landscapes or even the features of people not close to the camera.

The only disadvantage that occurred to Homer was that this grain—caused by the tiny negatives, each only 8 x 10 mm—made it unsuitable for making enlargements. 'However, most people only want to use the camera for snapshots.'

Compared with most cartridge load cameras, the Disc camera takes very sharp pictures. This is because the disc film can be kept very flat, ensuring sharp focus all over the frame.

Homer's pictures show that the camera can form a useful back-up to a 35 mm outfit, if the grainy pictures and lack of versatility are unimportant.



Creative approach

Creative COLOUR

The association and impact of colour often goes unnoticed in everyday life. But if you know what effects colour can have, you can reinforce its values and gain more control over your images

Our reactions to colour are incredibly complex—and when somebody looks at a colour photograph they react to much more than the subject of the image alone. Colour plays an important role in our lives, though we are not often consciously aware of it. So anyone using colour film must be very sensitive to the effects that colour has. With skill you can alter the whole effect of a particular photograph by selective use of colour.

Colour film is so widespread today that many people take it for granted, and do not think why they are using it. After all, we see the world in colour and it is only natural that we should want to photograph it in colour. But this can lead to problems. A good example is that of a landscape photograph into which someone wearing a red anorak has strayed. In black and white it would hardly be noticed, yet in colour it can be so strong in relation to the muted greens and browns that even a tiny figure can dominate the shot. They may well become the first thing that people will notice, creating a distraction that can destroy any sense of atmosphere in the final picture.

But there are plenty of occasions where colour is essential to the photograph. A picture of a rainbow would be virtually meaningless in black and white, while in colour it could work well. Many shots depend on colour, which is why it is important to know something about the way people respond to it.

The study of the effect of colour, the psychology of colour, is almost a science on its own, and is of great importance to people such as advertisers and designers who have to apply a great deal of thought and research to the colours they use. Their aim is to identify people's reactions to colour in order to exploit these reactions. For example, just as people would be very wary of eating blue food—for blue is not a colour that is normally associated with food—so they may hesitate to buy food products wrapped in blue packaging. And just as the correct choice of colour can be essential to the success or failure of a new consumer product, so it can be

essential to the success or failure of a photograph.

Choosing colour is far from the arbitrary process that it may at first seem, as many factors have to be considered. The simplest way to judge the effect of colour is to consider images that use only one overall or dominant colour. This does not necessarily mean images that have been made using coloured filters or gels, but images which through careful selection and composition have variations in just one colour, such as snow covered mountains, or a blue car

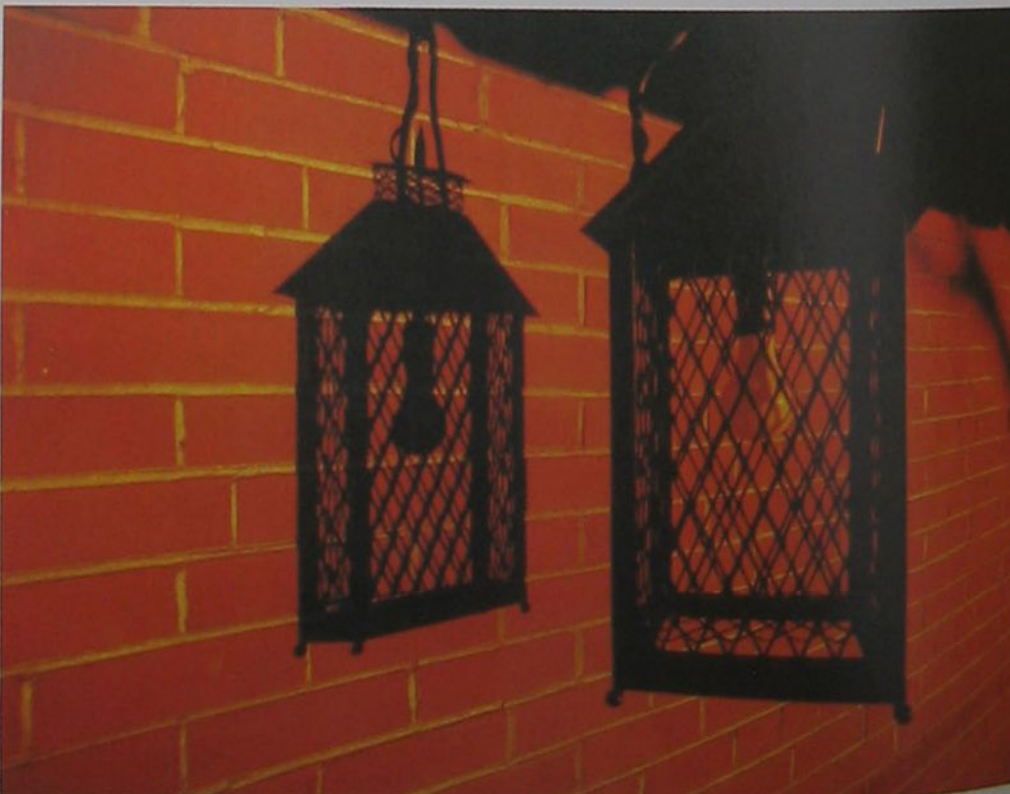
Mountainscape *With careful selection and composition, it is possible to exploit the subtle variations of just one colour for an atmospheric landscape*

Porch light *Warm colour, enhanced here by the late afternoon light, makes a shot appear more inviting—even if the subject itself is simple*



Yellow hull *Here the predominance of yellow gives the shot a summery feel, while the strength of the red is controlled by the careful framing*

Pier in winter *A blue sky can make an ideal background, especially for warmer foreground colours. Here, underexposure strengthened the colours*





J. Delaborde/Explorer



Ian McKinnell



John Sims

Creative approach

against a blue sky. It is surprising how many such images there are—the rich variation of green in a forest canopy, blond haired people on the beach, or the fascinating richness of reds and yellows in autumn, for example.

Colours tend to be divided into two distinct categories—warm and cold. Most people prefer warm colours, and often decorate their home in reds, yellows, oranges and browns. These colours can make a shot appear cheerful as they are the colours of summer, of holidays. Of all the colours red is

probably the strongest, the most vibrant. It is the colour of passion and of violence and needs to be handled with care. Red gets noticed, and it can be used to highlight small details in a photograph that may otherwise be overlooked, in the way that a bright poppy will stand out in the middle of a huge field of wheat. Use red to create a focal point, to concentrate the viewer's gaze. For example, if you are photographing a red car it is possible to shoot from a distance, and have the car very small surrounded by cooler colours—such as the grey of stone

buildings or the green of fields—and it will still stand out. When red is used boldly, filling the frame, it can create very strident images, images that shout.

Yellow is a sunny, happy colour, and gives this feeling to your shots. Look for yellow surroundings—such as a field of buttercups—as a background for photographing youngsters at play, with the colour reflecting the playfulness and joy of the children.

Brown and sepia are often nostalgic colours, evocative of times past, and this colour can create images that look as if

Boatbuilding In this shot the warm colour of the boat is emphasized in the foreground and contrasts with the strong blue sky

Car emblem A polarizer is very useful for giving strength to a blue sky and to a subject's colour—it is the strong colour that makes this shot



John Sims



David Parker



they were taken decades ago, even if they were only taken yesterday. Look for the rich, solid feel of old polished wood and try using it as a background for appropriate still lifes, such as small antiques.

At the opposite end of the spectrum are the cold colours—blues and violets. Think of their associations—winter, ice, night, 'feeling blue'. Blue can have a very chilling, eerie effect—notice how often blue is the dominating colour in science fiction and horror films. You can use the same effect in your own photographs, shooting through blue filters or on tungsten film in daylight. This will make

Bench and shadows A worthwhile technique is to select an area which is dull and grey, but to frame the shot to include a patch of bright colour

Deckchairs The striking colours of sunset can make strong photographs but it is best to include foreground interest like these flashlit deckchairs

John de Visser



Chris Steele-Perkins/Magnum



colour, such as blue or pink. This slight cast can add a great deal of atmosphere. Grey is also the perfect foil for other colours as its neutrality emphasizes their hue. Black is also a good background colour, making colours appear much more intense and saturated.

Remember that there can be countless hues of each colour—there are cold-looking acid yellows as well as the warm yellows that Kodak use, and this can make a great deal of difference to our interpretation. In particular the human eye is very sensitive to variation in skin tone and the colour of food. People tend to respond more favourably to shots which are slightly warm, giving skin a faint glow, as if suntanned, making food look more appetizing and rooms look more welcoming. A slight blue bias can make people look very unhealthy, and rooms cold and unfriendly. These small changes in colour balance can be made using light balancing filters. More strongly coloured filters, such as graduated or effects filters, allow you to add colours of your choice in a variety of circumstances.

The more technical aspects of colour—notably the contrast and saturation—also have an effect on the final result. If you think of colours as being warm or cold, you can think of the contrast as the temperature difference. High contrast gives a very intense picture in which the warmth or coldness of the colours is exaggerated. Low contrast has a much more subtle effect.

You can control the contrast of your shots by the choice of film and filter. A slow, contrasty film used on a brilliantly sunny day with a polarizing filter gives one extreme, while a fast film shot on an overcast day with a diffuser gives the other. In addition, you can vary the appearance by under- or overexposing the film. Underexposing gives deep colours while overexposing desaturates them. These techniques give you additional means of controlling the intensity of colour in a shot.

When the values and qualities of colour are analyzed they seem very complicated, yet the photographer makes decisions about colours every time he or she takes a picture, even if it is only that the colours look nice. To learn more about the way colours work, it is a good idea to simply look at pictures, either your own or others', and to try and assess the effect that the colours have.

Ask yourself questions about the colours. Would the shot have worked as well in black and white? If colour is vital, what does it add to the image? Does it give a sense of mood or emotion, or does it merely represent the colours that were in the scene? And does it exploit the potential of colour film, or is it an image that happens to be coloured?

Not every picture you take can be changed to make full use of colour. But it is worth doing what you can to exploit the beauty of colour photography wherever possible.

your friends and the most familiar objects take on a very sinister appearance.

But blue need not be only a sombre colour—it is also the colour of summer skies and can be the perfect counterpart for splashes of brighter colour. Blue is often used as a background for portraiture, as its cool dignity presents a strong contrast to the warmth of skin tones. Look for objects against a blue sky, such as buildings, trees, fences, and note the way that the colours react with each other. Another quality that makes blue the perfect colour for backgrounds is that it appears a recessive colour—that is it will appear to be behind other colours, since we associate it with distant views.

Red, on the other hand, is an advanc-

Shades of green *A large expanse of green does not always look attractive in a photograph, but here the variety of hues makes the colour more effective*

ing colour—it will appear to be in front of other colours. Thus in a shot of a red fence against a blue sky the red will appear almost to leap out of the background.

Green is a colour that is immediately associated with nature, the colour of plants, foliage and vegetation, and it can have a very restful, soothing effect. A leafy forest glade has a feeling of peace and serenity.

Black, white and grey can also be used in colour photography, often to good effect. Greys are rarely totally neutral, and are usually slightly tinted with

Stephen J. Krasemann/DRK Photo

What went wrong?

WATER

Everyone is attracted by running water—yet often the results look dull, since the photographs fail to capture its vital ingredients. Colin Molyneux analyzes what went wrong with a variety of water shots



Light is to photography as heat is to cookery—the quality and quantity are important, and without it nothing happens at all. This picture is undercooked. It is flat, dull and uninteresting because the lighting is flat, dull and uninteresting. The ingredients are there—the shape and form of the creeper clad building and the dramatic flow of water through the arch, but there is nothing to give it any sparkle. Under the circumstances I would not have bothered to take a photograph at all. I would have come back and looked at the subject at different times of the day—even in the evening. Then perhaps lights in the windows or street lights would have given it a lift, and the long exposure necessary at dusk would have lent some interest to the water. If for some reason it was impossible to come back at another more favourable time I would have tried a telephoto lens, concentrating on the water and the section of the building with the arch only. An 81B filter (brownish) would have helped to warm up the cold colour



The one thing you need for a successful landscape photograph is patience. This picture would have benefited from a splash of light to give the water some sparkle. Falling any sunshine I would have tried using a very long shutter speed to give the water that lovely milky look and lift it out of the ordinary. In composition, a move to the left would have helped make the river lead the eye through the picture more. It would also have cut out the dustbin. I like this figure in red but I would have moved it down frame a little

All the elements for a dramatic picture—rushing water, hard graphic shapes of the rocks—are here, but the impact it should have had is lacking. The reason I feel is

the composition. If the photographer had chosen an angle more directly over the flow of the water the picture would have benefited in two ways. First, it would have directed the viewer's attention to the most important element of the picture, the water itself.

Secondly, the higher viewpoint would have made it possible to make more dynamic use of the natural diagonal of the stream by bringing it into the picture at the extreme top left corner of the frame and out at the bottom right. Always analyze the subject in the viewfinder before pressing the button



